IMPERIAL COUNTY
AIR POLLUTION CONTROL DISTRICT

May 15, 2016
Exceptional Event Documentation
For the Imperial County PM_{10} Nonattainment Area

FINAL REPORT

December 11, 2018

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ACRONYM	DESCRIPTIONS
AOD	Aerosol Optical Depth
AQI	Air Quality Index
AQS	Air Quality System
BACM	Best Available Control Measures
BAM 1020	Beta Attenuation Monitor Model 1020
BLM	United States Bureau of Land Management
BP	United States Border Patrol
CAA	Clean Air Act
CARB	California Air Resources Board
CMP	Conservation Management Practice
DCP	Dust Control Plan
DPR	California Department of Parks and Recreation
EER	Exceptional Events Rule
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GOES-W/E	Geostationary Operational Environmental Satellite (West/East)
HC	Historical Concentrations
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
ICAPCD	Imperial County Air Pollution Control District
INPEE	Initial Notification of a Potential Exceptional Event
ITCZ	Inter Tropical Convergence Zone
KBLH	Blythe Airport
KCZZ	Campo Airport
KIPL	Imperial County Airport
KNJK	El Centro Naval Air Station
KNYL/MCAS	Yuma Marine Corps Air Station
KPSP/PSP	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Rgnl Airport)
PST	Local Standard Time
MMML/MXL	Mexicali, Mexico Airport
MODIS	Moderate Resolution Imaging Spectroradiometer
MPH	Miles Per Hour
MST	Mountain Standard Time
NAAQS	National Ambient Air Quality Standard
NCAR	National Center for Atmospheric Research
NCEI	National Centers for Environmental Information
NEAP	Natural Events Action Plan
NEXRAD	Next-Generation Radar
NOAA	National Oceanic and Atmospheric Administration
nRCP	Not Reasonably Controllable or Preventable
NWS	National Weather Service

PDT	Pacific Daylight Time
PM_{10}	Particulate Matter less than 10 microns
$PM_{2.5}$	Particulate Matter less than 2.5 microns
PST	Pacific Standard Time
QA/QC	Quality Assured and Quality Controlled
QCLCD	Quality Controlled Local Climatology Data
RACM	Reasonable Available Control Measure
RAWS	Remote Automated Weather Station
SIP	State Implementation Plan
SLAMS	State Local Ambient Air Monitoring Station
SMP	Smoke Management Plan
SSI	Size-Selective Inlet
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTC	Coordinated Universal Time
WRCC	Western Regional Climate Center

I Introduction

On May 15, 2016, State and Local Ambient Air Monitoring Stations (SLAMS), located in Niland (AQS Site Code 060254004) California measured an exceedance of the National Ambient Air Quality Standard (NAAQS). The Federal Equivalent Method (FEM), Beta Attenuation Monitor Model 1020 (BAM 1020) measured (midnight to midnight) 24-hr average Particulate Matter less than 10 microns (PM_{10}) concentration of 216 µg/m^3 (**Table 1-1**). PM_{10} 24-hr measurements above 150 µg/m^3 are exceedances of the NAAQS. The SLAMS in Niland was the only station in Imperial County to measure an exceedance of the PM_{10} NAAQS on May 15, 2016.

TABLE 1-1
CONCENTRATIONS OF PM_{10} ON *MAY 15, 2016

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION µg/m^3	PM_{10} NAAQS µg/m^3
5/15/2016	**Niland**	**06-025-4004**	**3**	**24**	**216**	**150**
5/15/2016	Brawley	06-025-0007	3	24	59	150
5/15/2016	Calexico	06-025-0005	3	24	57	150
5/15/2016	El Centro	06-025-1003	4	24	68	150
5/15/2016	Westmorland	06-025-4003	3	24	100	150

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted[1]

The Imperial County Air Pollution Control District (ICAPCD) has been submitting PM_{10} data from Federal Reference Method (FRM) Size Selective Instruments (SSI) since 1986 into the United States Environmental Protection Agency's (USEPA) Air Quality System (AQS). Prior to 2013 all continuous measured PM_{10} data was non-regulatory, thus measured in local conditions. However, by 2013 ICAPCD began formally submitting continuous FEM PM_{10} data from BAM 1020's into the USEPA managed AQS. Because regulatory consideration of reported data must be in standard conditions, as required by USEPA, all continuous PM_{10} data since 2013 is regulatory. On May 15, 2016, the Niland monitor was impacted by elevated particulate matter caused by the entrainment of fugitive windblown dust from gusty west winds associated with a Pacific weather system that moved from the Pacific north in an east-southeast direction primarily affecting the northwest section of Imperial County.

This report demonstrates that a naturally occurring event caused an exceedance observed on May 15, 2016, which elevated particulate matter and affected air quality. The report provides concentration to concentration monitoring site analyses supporting a clear causal relationship between the event and the monitored exceedances and provides an analysis supporting the not reasonably controllable or preventable (nRCP) criteria. Furthermore, the report provides

[1] According to the National Institute of Standards and Technology (NIST) Time and Frequency Division the designation of the time of day for specific time zones are qualified by using the term "standard time" or "daylight time". For year-round use the designation can be left off inferring "local time" daylight or standard whichever is present. For 2016 Pacific Daylight Time (PDT) is March 13 to November 6. https://www.nist.gov/pml/time-and-frequency-division/local-time-faqs#intl

information that the exceedances would not have occurred without the entrainment of fugitive windblown dust from outlying deserts and mountains within the Sonoran Desert. The document further substantiates the request by the ICAPCD to exclude the PM_{10} 24-hour NAAQS exceedance of 216 µg/m^3 (**Table 1-1**) as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER)[2].

I.1 Demonstration Contents

Section II - Describes the May 15, 2016 event as it occurred in California and into Imperial County, providing background information of the exceptional event and explaining how the wind driven emissions from the event led to the exceedance at the Niland monitor.

Section III – Using time-series graphs, summaries and historical concentration comparisons of the Niland station this section discusses and establishes how the May 15, 2016 event affected air quality such that a clear causal relationship is demonstrated between the event and the monitored exceedance. It is perhaps of some value to mention that the time-series graphs include PM_{10} data measured in both local conditions and standard conditions. Measured PM_{10} continuous data prior to 2013 is in local conditions, all other data is in standard conditions. The concentration difference between local and standard conditions has an insignificant impact on any data analysis. Overall, this section provides the evidence that human activity played little or no direct causal role in the May 15, 2016 event and its resulting emissions defining the event as a “natural event”.[3]

Section IV - Provides evidence that the event of May 15, 2016 was not reasonably controllable or preventable despite the full enforcement and implementation of Best Available Control Measures (BACM).

Section V - Brings together the evidence presented within this report to show that the exceptional event affected air quality; that the event was not reasonably controllable or preventable; that there was a clear causal relationship between the event and the exceedance, and that the event was a natural event.

I.2 Requirement of the Exceptional Event Rule

The above sections combined comprise the technical requirements described under the Exceptional Events Rule (EER) under 40 CFR §50.14(c)(3)(iv). However, in order for the USEPA to concur with flagged air quality monitoring data, there are additional non-technical requirements.

I.2.a Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

[2] "Treatment of Data Influenced by Exceptional Events; Final Guidance", 81 FR 68216, October 2, 2016

[3] Title 40 Code of Federal Regulations part 50: §50.1(k) Natural event means an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.

The ICAPCD posted the National Weather Service (NWS) forecast as an extended weekend notification via the ICAPCD's webpage on Friday, May 13, 2016. The notice advised the public that a Pacific weather system would move into the western states as early as Saturday, May 14, 2016. The Pacific weather system and associated trough would deepen through Sunday, May 15, 2016 creating gusty westerly winds over the mountains and deserts from late Saturday through Monday morning. Unlike the Phoenix NWS office, the San Diego NWS office issued two Urgent Weather messages that included wind advisories. The first wind advisory issued at 3:14am PST Saturday, May 14, 2016 was followed by a second wind advisory issued at 2:40am PST Sunday, May 15, 2016. Both wind advisories advised of west winds 20 to 30 mph with gusts to 50 mph and isolated gusts to 60 mph. The second wind advisory expired Monday, May 16, 2016 during the early morning hours. Because of the potential for suspended particles and poor air quality, the ICAPCD issued a "No Burn" day advisory for Imperial County on May 15, 2016. **Appendix A** contains copies of all notices pertinent to the event for May 15, 2016.

I.2.b Initial Notification of Potential Exceptional Event (INPEE) (40 CFR §50.14(c)(2))

States are required under federal regulation to submit measured ambient air quality data into the AQS. AQS is the federal repository of Quality Assured and Quality Controlled (QA/QC) ambient air data used for regulatory purposes. When States intend to request the exclusion of one or more exceedances of a NAAQS as an exceptional event a notification to the Administrator is required. The notification is accomplished by flagging the data in AQS and providing an initial event description.

On October 3, 2016, the US EPA promulgated revisions to the Exceptional Events rule, which included the requirement of an "Initial Notification of Potential Exceptional Event" (INPEE) process. This revised INPEE process requires communication between the US EPA regional office and the State, prior to the development of a demonstration. The intent of the INPEE process is twofold: to determine whether identified data may affect a regulatory decision and whether a State should develop/submit an EE Demonstration.

The ICAPCD made a formal written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured PM_{10} concentrations from the Niland monitors on April 17, 2017. The INPEE, for the May 15, 2016 event, was formally submitted by the CARB to USEPA Region 9 on April 24, 2017. Subsequently there after a second revised request was sent to CARB requesting preliminary flags on additional days during 2016. **Table 1-1** above provides the PM_{10} measured concentrations for all monitors in Imperial County for May 15, 2016. A brief description of the meteorological conditions was provided to CARB, which provided preliminary information that indicated a potential natural event had occurred on May 15, 2016.

I.2.c Documentation that the public comment process was followed for the event demonstration that was flagged for exclusion (40 CFR §50.14(c)(3)(v))

The ICAPCD posted, for a 30-day public review, a draft version of this demonstration on the

ICAPCD webpage and published a notice of availability in the Imperial Valley Press on January 10, 2018. The published notice invited comments by the public regarding the request, by the ICAPCD, to exclude the measured concentrations of 216 µg/m^3, which occurred on May 15, 2016 in Niland. The final closing date for comments was February 12, 2018. **Appendix A** contains a copy of the public notice affidavit along with any comments received by the ICAPCD for submittal as part of the demonstration (40 CFR §50.14(c)(3)(v)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(c)(3)(i))

States that have flagged data as a result of an exceptional event and who have requested an exclusion of said flagged data are required to submit a demonstration that justifies the data exclusion to the USEPA in accordance with the due date established by USEPA during the INPEE process (40 CFR §50.14(c)(2)). Currently, bi-weekly meetings between USEPA, CARB and Imperial County are set to discuss each flagged exceedance for 2016.

The ICAPCD, after the close of the comment period and after consideration of the comments will submit this demonstration along with all required elements, including received comments and responses to USEPA Region 9 in San Francisco, California. The submittal of the May 15, 2016 demonstration will have a regulatory impact upon the development and ultimate submittal of the PM_{10} State Implementation Plan for Imperial County in 2017.

I.2.e Necessary demonstration to justify an exclusion of data under (40 CFR§50.14(c)(3)(iv))

A This demonstration provides evidence that the event, as it occurred on May 15, 2016, satisfies the definition in 40 CFR §50.1(j) and (k) for an exceptional event.

a The event created the meteorological conditions that entrained emissions and caused the exceedance.
b The event clearly "affects air quality" such that there is the existence of a clear causal relationship between the event and the exceedance.
c Analysis demonstrates that the event-influenced concentrations compared to concentrations at the same monitor at other times supports the clear causal relationship.
d The event "is not reasonably controllable and not reasonably preventable."
e The event is "caused by human activity that is unlikely to recur at a particular location or [is] a natural event."
f The event is a "natural event" where human activity played little or no direct causal role.

B This demonstration provides evidence that the exceptional event affected air quality in Imperial County by demonstrating a clear causal relationship between the event and the measured concentrations in Niland.

C This demonstration provides evidence of the measured concentrations to concentrations at the same monitor at other times supporting the clear causal relationship between the event and the affected monitor.

II May 15, 2016 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the May 15, 2016 event unfolded in Imperial County. The subsection elements include

» A description and map of the geographic setting of the air quality and meteorological monitors
» A description of Imperial County's climate
» An overall description of meteorological and air quality conditions on the event day.

II.1 Geographic Setting and Monitor Locations

According to the United States Census Bureau, Imperial County has a total area of 4,482 square miles of which 4,177 square miles is land and 305 square miles is water. Much of Imperial County is below sea level and is part of the Colorado Desert an extension of the larger Sonoran Desert (**Figure 2-1)**. The Colorado Desert not only in includes Imperial County but a portion of San Diego County.

FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY

Fig 2-1: 1997 California Environmental Resources Evaluation System. According to the United States Geological Survey (USGS) Western Ecological Research Center the Colorado Desert bioregion is part of the bigger Sonoran Desert Bioregion which includes the Colorado Desert and Upper Sonoran Desert sections of California and Arizona, and a portion of the Chihuahuan Basin and Range Section in Arizona and New Mexico (Forest Service 1994).

A notable feature in Imperial County is the Salton Sea, which is at approximately 235 feet below sea level. The Chocolate Mountains are located east of the Salton Sea and extend in a northwest-southeast direction for approximately 60 miles (**Figure 2-2)**. In this region, the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect the northern-most extensions of the East Pacific rise. Consequently, the region is subject to earthquakes and the crust is being stretched, resulting in a sinking of the terrain over time.

FIGURE 2-2
SURROUNDING AREAS OF THE SALTON SEA

Fig 2-2: Image courtesy of the Image Science and Analysis Laboratory NASA Johnson Space Center, Houston Texas

All of the seven incorporated cities, including the unincorporated township of Niland, are surrounded by agricultural fields to the north, east, west and south (**Figure 2-6)**. Together, the incorporated cities, including Niland, and the agricultural fields make what is known as the Imperial Valley. Surrounding the Imperial Valley are desert areas found on the eastern and western portions of Imperial County.

The desert area, found within the western portion of Imperial County is of note because of its border with San Diego County. From west to east, San Diego County stretches from the Pacific Ocean to its boundary with Imperial County. San Diego County has a varied topography. On its western side is 70 miles (110 km) of coastline. Most of San Diego between the coast and the Laguna Mountains consists of hills, mesas, and small canyons. Snow-capped (in winter) mountains rise to the northeast, with the Sonoran Desert to the far east. Cleveland National Forest is spread across the central portion of the county, while the Anza-Borrego Desert State Park occupies most of the northeast. The southeastern portion of San Diego County is comprised of distinctive Peninsular mountain ranges. The mountains and deserts of San Diego comprise the eastern two-thirds of San Diego County and are primarily undeveloped back county with a native plant community known as chaparral. Of the nine major mountain ranges within San Diego County, the In-Ko-Pah Mountains and the Jacumba Mountains border Mexico and Imperial County.

Both mountain ranges provide the distinctive weathered dramatic piles of residual boulders that can be seen while driving Interstate 8 from Imperial County through Devil's Canyon and In-Ko-Pah Gorge. Interstate 8 runs along the US border with Mexico from San Diego's Mission Bay to just southeast of Casa Grande Arizona.

FIGURE 2-3
JACUMBA PEAK

Fig 2-3: The Jacumba Mountains reach an elevation of 4,512 feet (1,375 m) at Jacumba Peak, near the southern end of the chain. Source: Wikipedia at https://en.wikipedia.org/wiki/Jacumba_Mountains

Northwest and northeast of the Jacumba Mountains is the Tierra Blanca Mountains, the Sawtooth Mountains and Anza-Borrego Desert State Park. Within the mountain ranges and the Anza-Borrego Desert State Park, there exists the Vallecito Mountains, the Carrizo Badlands, the Carrizo Impact Area, Coyote Mountains and the Volcanic Hills to name of few. Characteristically, these areas all have erosion that has occurred over time that extends from the Santa Rosa Mountains into northern Baja California in Mexico. For example, the Coyote Mountains consists of sand dunes left over from the ancient inland Sea of Cortez. Much of the terrain is still loose dirt, interspersed with sandstone and occasional quartz veins. The nearest community to the Coyote Mountain range is the community of Ocotillo. Of interest are the fossilized and hollowed out sand dunes that produce wind caves.

FIGURE 2-4
ANZA-BORREGO DESERT STATE PARK
CARRIZO BADLANDS

Fig 2-4: View southwest across the Carrizo Badlands from the Wind Caves in Anza-Borrego Desert State Park. Source: Wikipedia at https://en.wikipedia.org/wiki/Carrizo_Badlands

The Carrizo Badlands, which includes the Carrizo Impact Area used by the US Navy as an air-to-ground bombing range during World War II and the Korean War, lies within the Anza-Borrego Desert State Park. The Anza-Borrego Desert State Park is located within the Colorado Desert, is the largest state park in California occupying eastern San Diego County, reaching into Imperial and Riverside counties. The two communities within Anza-Borrego Desert State Park are Borrego Springs and Shelter Valley.

The Anza-Borrego Desert State Park lies in a unique geologic setting along the western margin of the Salton Trough. The area extends north from the Gulf of California to San Gorgonio Pass and from the eastern rim of the Peninsular Ranges eastward to the San Andreas Fault zone along the far side of the Coachella Valley. The Anza-Borrego region changed gradually over time from intermittently being fed by the Colorado River Delta to dry lakes and erosion from the surrounding mountain ranges. The area located within the southeastern and northeastern section of San Diego County is a source of entrained fugitive dust emissions that impact Imperial County when westerly winds funnel through the unique landforms causing in some cases wind tunnels that cause increases in wind speeds.

Historical observations have indicated that the desert slopes and mountains of San Diego are a source of fugitive emissions along with those deserts located to the east and west of Imperial County, which extend into Mexico (Sonoran Desert, **Figure 2-7**). Combined, the desert areas and mountains of San Diego and the desert areas that extend into Mexico are sources of dust emissions, which affect the Imperial County during high wind events.

FIGURE 2-5
ANZA-BORREGO DESERT STATE PARK
DESERT VIEW FROM FONT'S POINT

Fig 2-5: Desert view from Font's Point. Source: Font's Point Anza-Borrego Photographed by and copyright of (c) David Corby; Wikipedia at https://en.wikipedia.org/wiki/Anza-Borrego_Desert_State_Park

FIGURE 2-6
LOCATION AND TOPOGRAPHY OF IMPERIAL COUNTY

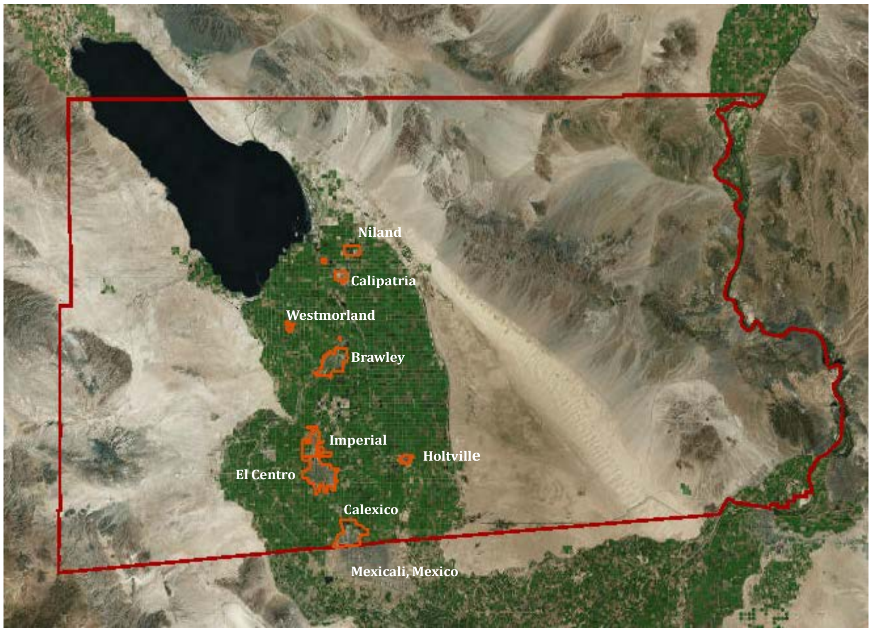


Fig 2-6: Depicts the seven incorporated cities within Imperial Valley - City of Calipatria, City of Westmorland, City of Brawley, City of Imperial, City of El Centro, City of Holtville, City of Calexico. Niland is unincorporated. Mexicali, Mexico is to the south.

FIGURE 2-7
DESERTS IN CALIFORNIA, YUMA AND MEXICO

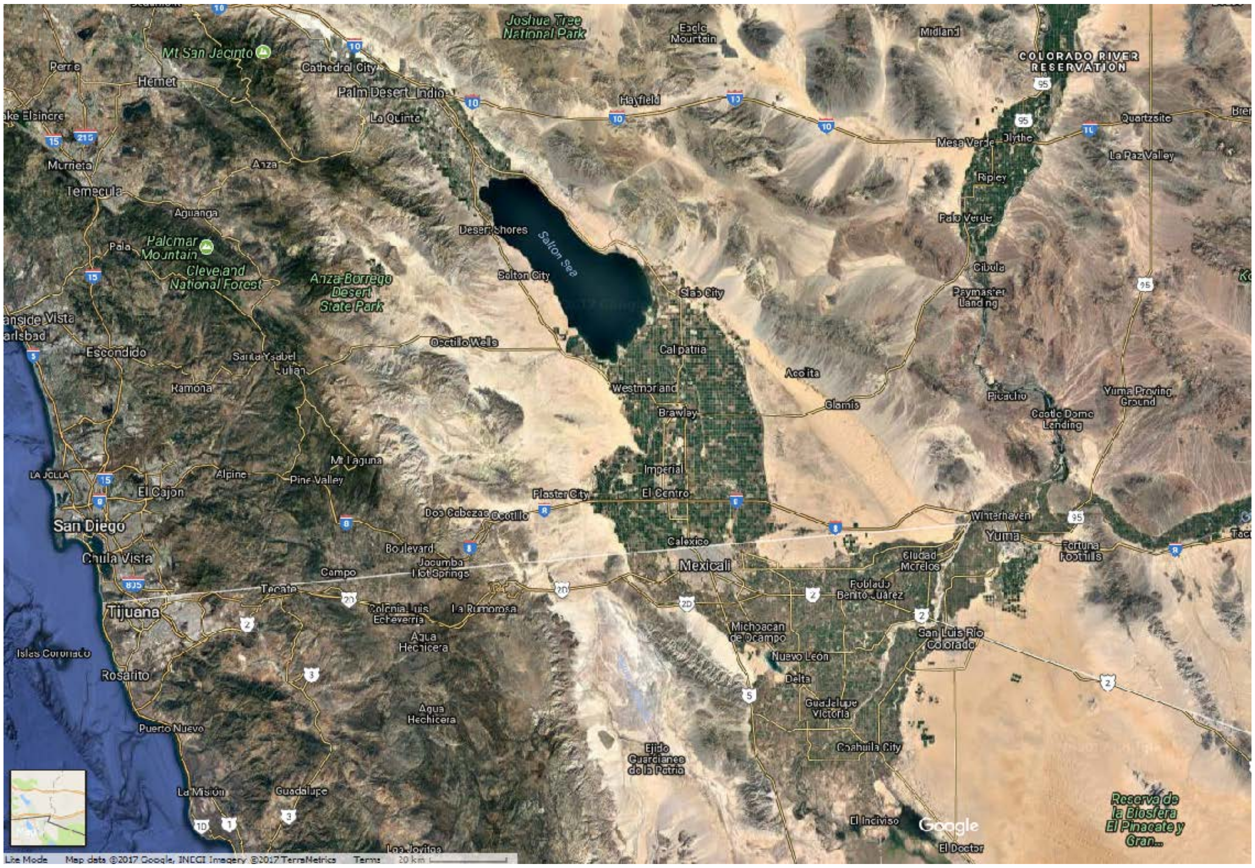


Fig 2-7: Depicts the Sonoran Desert as it extends from Mexico into Imperial County. Source: Google Earth Terra Matrics.

The air quality and meteorological monitoring stations used in this demonstration are shown in **Figure 2-8**. Of the five SLAMS within Imperial County four stations measure both meteorological and air quality data. These SLAMS are located in Calexico, El Centro, Westmorland, and Niland; the station located in Brawley only measures air quality. Other air monitoring stations measuring air quality and meteorological data used for this demonstration include stations in eastern Riverside County, southeastern San Diego County and southwestern Arizona (Yuma County) (**Figure 2-8 and Table 2-1)**.

As mentioned above, the PM_{10} exceedance on May 15, 2016, occurred at the Niland station. The Niland station is located a "northern" monitoring site within the Imperial County air monitoring network. In order to properly analyze the contributions from meteorological conditions occurring on May 15, 2016, other meteorological sites were used in this demonstration which include airports in eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), Imperial County, and other sites relevant to the wind event, such as within northern Mexico. (**Figure 2-8 and Appendix B)**.

FIGURE 2-8
MONITORING SITES IN AND AROUND IMPERIAL COUNTY

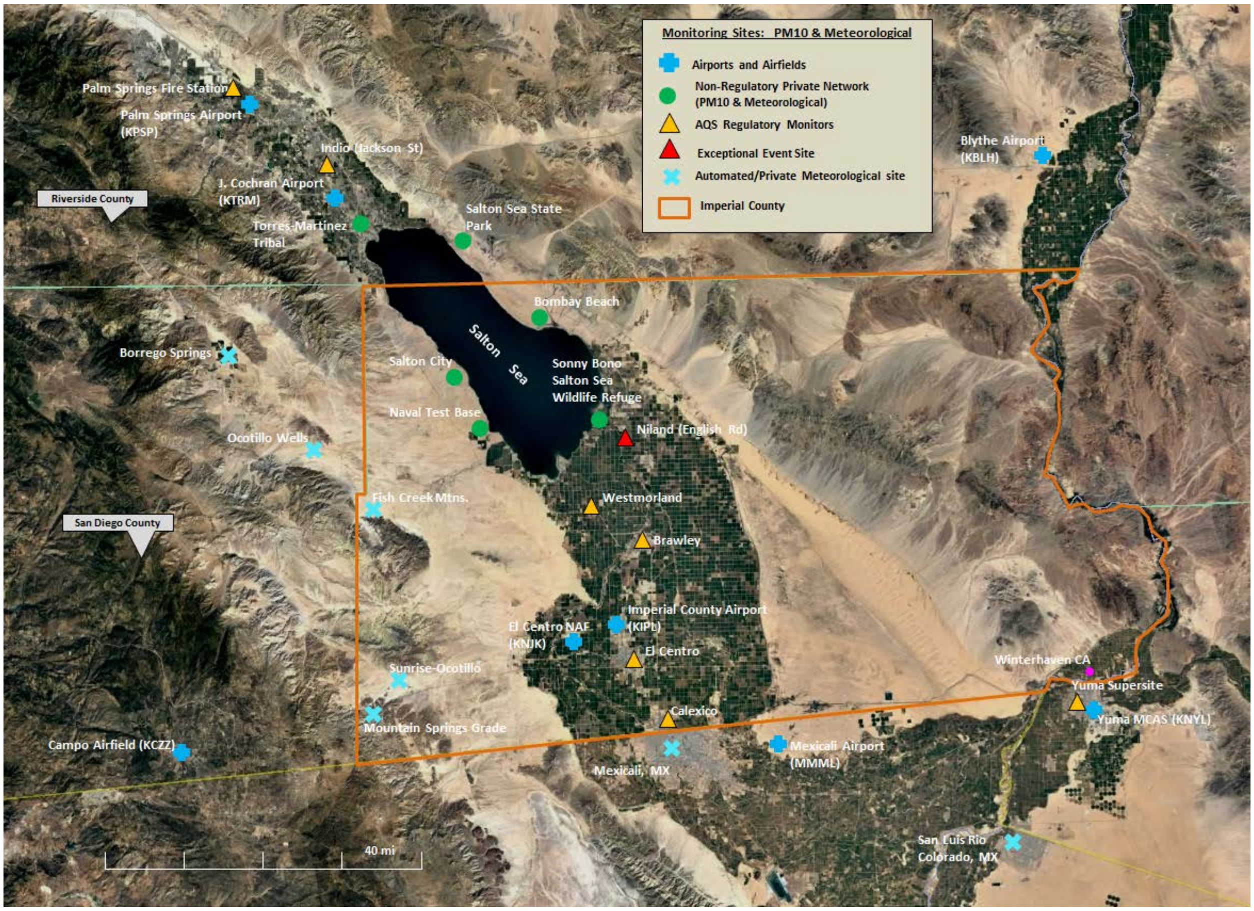


Fig 2-8: Depicts a select group of meteorological and PM_{10} monitoring sites in Imperial County, eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), and northern Mexico. The image provides the location of potential sites used to gather data in support an Exceptional Event Demonstration. Source: Google Earth.

In addition to meteorological sites, there are non-regulatory PM_{10} sites located around the Salton Sea that maybe referenced as an aid to help the reader understand the direction and velocity of winds that affect Imperial County. Unless, otherwise specifically indicated concentration references do not imply emissions from the surrounding playa of the Salton Sea. Three sites, in specific, are the Salton City air monitoring station, the Naval Test Base air monitoring station and the Sonny Bono air monitoring station. These stations are privately owned and non-regulatory (**Figures 2-9 to 2-12**). The Salton City station is located 33.27275°N latitude and 115.90062˚W longitude, on the western edge of the Salton Sea (**Figure 2-9**). The station abuts a water reservoir along the Salton Sea with surrounding chaparral vegetation and unpaved open areas and roads. The Naval Test Base station is located 33.16923°N latitude and 115.85593˚W longitude, on the southwestern edge of the Salton Sea (**Figure 2-11**). The station sits on an abandoned US Military site, still owned by the Department of Defense. Unlike the Salton City station, light chaparral vegetation and sandy open dune areas surround the Naval Test Base station. Directly to the west of the station is an orchard. The Sonny Bono station is located 33.17638°N latitude and 115.62310˚W longitude, on the southern portion of the Salton Sea within the Sonny Bono Salton Sea Wildlife Refuge. The Sonny Bono Salton Sea National Wildlife Refuge is 40 miles north of the Mexican border at the southern end of the Salton Sea within the Sonoran Desert. The Refuge has two separate managed units, 18 miles apart. Each unit contains wetland habitats, farm fields, and tree rows. The land of the Salton Sea Refuge is flat, except for Rock Hill, a small, inactive volcano, located near Refuge Headquarters. Bordering the Refuge is the Salton Sea on the north and farmlands on the east, south, and west.

FIGURE 2-9
SALTON CITY AIR MONITORING STATION

Fig 2-9: Depicts the Salton City air monitoring (circled) site operated by a private entity. Site photos can be seen at the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-10
SALTON CITY AIR MONITORING STATION
WEST

Fig 2-10: Photograph taken by the California Air Resources Board audit team in 2017. The photograph is taken from the west facing the probe. https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-11
NAVAL TEST BASE AIR MONITORING STATION

Fig 2-11: Depicts the Naval Test Base air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13603&date=17

FIGURE 2-12
NAVAL TEST BASE AIR MONITORING STATION
WEST

Fig 2-12: Photograph taken by the California Air Resources Board audit team in 2017. The photograph is taken from the west facing the probe. https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-13
SONNY BONO AIR MONITORING STATION

Fig 2-13: Depicts the Sonny Bono air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-14
SONNY BONO SALTON SEA NATIONAL WILDLIFE REFUGE

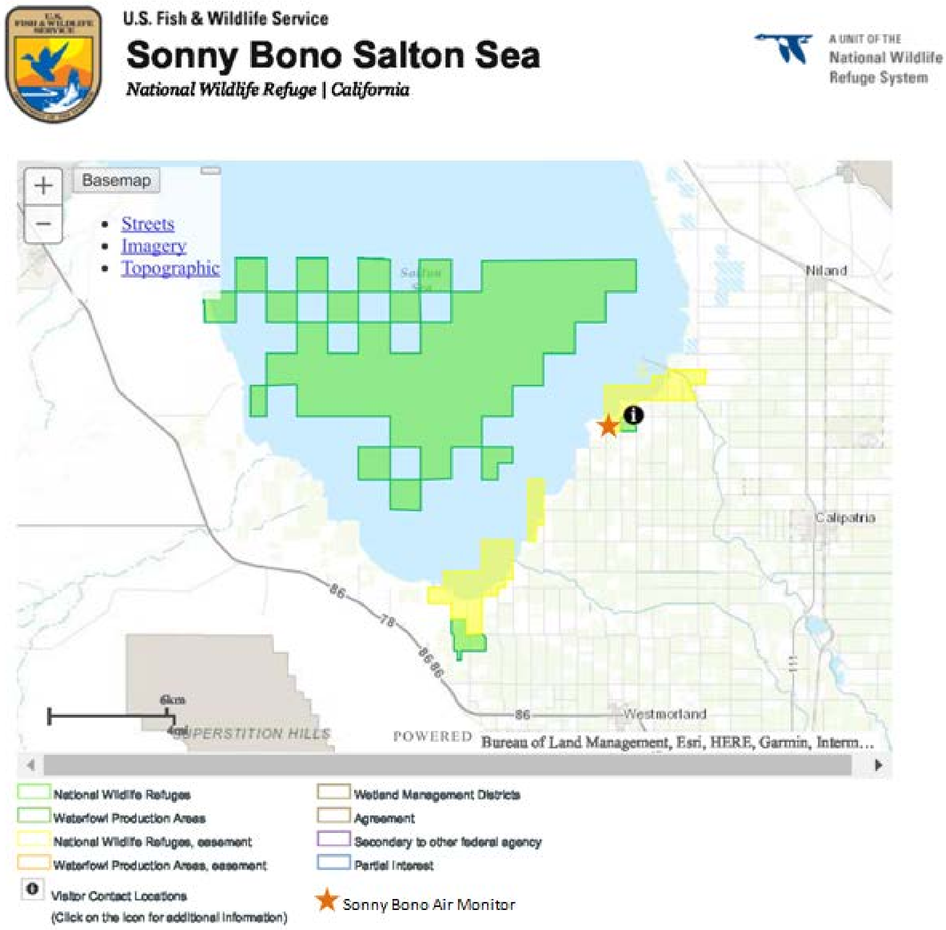


Fig 2-14: The Sonny Bono Wildlife Refuge has about 2,000 acres that are farmed and managed for wetlands. In 1998, the Refuge was renamed after Congressman Sonny Bono, who helped inform the U.S. Congress of the environmental issues facing the Salton Sea as well as acquiring funding for this Refuge to help it respond to avian disease outbreaks and other habitat challenges at the Salton Sea. Source: https://www.fws.gov/refuge/Sonny_Bono_Salton_Sea/about.html

TABLE 2-1
MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
MAY 15, 2016

Monitor Site Name	*Operator	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	24-hr PM_{10} ($\mu g/m^3$) Avg	1-hr PM_{10} ($\mu g/m^3$) Max	**Time of Max Reading	Max Wind Speed (mph)	**Time of Max Wind Speed
IMPERIAL COUNTY											
Brawley-Main Street #2	ICAPCD	Hi-Vol Gravimetric	06-025-0007	(81102)	13701	-15	-	-	-	-	-
		BAM 1020					59	219	16:00		
Calexico-Ethel Street	CARB	BAM 1020	06-025-0005	(81102)	13698	3	57	226	15:00	18.2	15:00
El Centro-9th Street	ICAPCD	BAM 1020	06-025-1003	(81102)	13694	9	68	170	19:00	16.9	16:00
Niland-English Road	ICAPCD	Hi-Vol Gravimetric	06-025-4004	(81102)	13997	-57	-	-	-	23.3	17:00
		BAM 1020					216	671	17:00		
Westmorland	ICAPCD	BAM 1020	06-025-4003	(81102)	13697	-43	100	411	17:00	16.7	18:00
RIVERSIDE COUNTY											
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	(81102)	33137	174	31	98	14:00	-	-
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	(81102)	33157	1	262.2	0:00	14:00	19	14:00
ARIZONA – YUMA											
Yuma Supersite	ADEQ	TEOM	04-027-8011	(81102)	N/A	60	57	203	18:00	-	-

*CARB = California Air Resources Board
*ICAPCD = Air Pollution Control District, Imperial County
*SCAQMD = South Coast Air Management Quality District
*ADEQ =Arizona Department of Environmental Quality

**Time represents the actual time/hour of the measurement in question according to the zone time (PST unless otherwise noted)

II.2 Climate

As mentioned above, Imperial County is part of the Colorado Desert, which is a subdivision of the larger Sonoran Desert (**Figure 2-15**) encompassing approximately 7 million acres (28,000 km^2). The desert area encompasses Imperial County and includes parts of San Diego County, Riverside County, and a small part of San Bernardino County.

FIGURE 2-15
SONORAN DESERT REGION

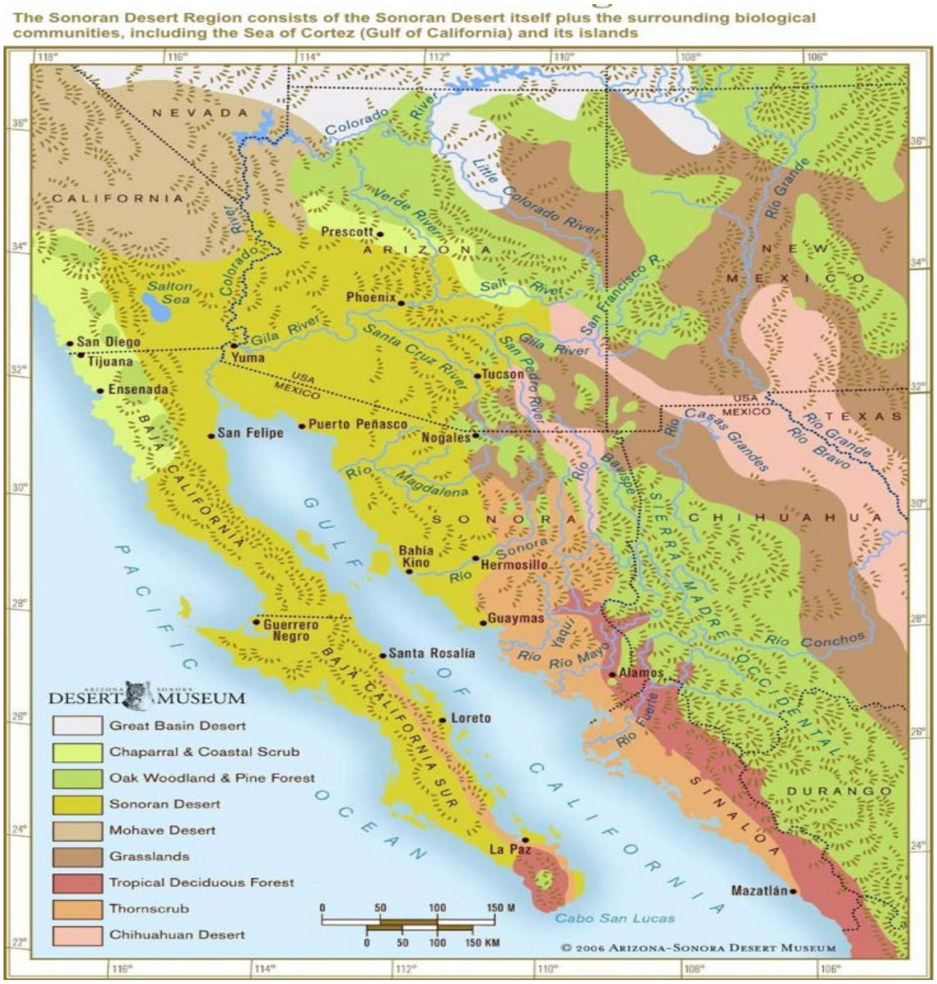


Fig 2-15: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at http://desertmuseum.org/center/map.php

The majority of the Colorado Desert lies at a relatively low elevation, below 1,000 feet (300 m), with the lowest point of the desert floor at 275 feet (84 m) below sea level at the Salton Sea. Although the highest peaks of the Peninsular Range reach elevations of nearly 10,000 feet (3,000 m), most of the region's mountains do not exceed 3,000 feet (910 m).

In the Colorado Desert (Imperial County), the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect to the northern-most extensions of the East Pacific Rise. Consequently, the region is subject to earthquakes, and the crust is being stretched, resulting in a sinking of the terrain over time.

The Colorado Desert's climate distinguishes it from other deserts. The region experiences greater summer daytime temperatures than higher-elevation deserts and almost never experiences frost. In addition, the Colorado Desert experiences two rainy seasons per year (in the winter and late summer), especially toward the southern portion of the region which includes a portion of San Diego County. The Colorado Desert portion of San Diego County receives the least amount of precipitation. Borrego Springs, the largest population center within the San Diego desert region averages 5 inches of rain with a high evaporation rate. By contrast, the more northerly Mojave Desert usually has only winter rains.

The west coast Peninsular Ranges, or other west ranges, of Southern California–northern Baja California, block most eastern Pacific coastal air and rains, producing an arid climate. Other short or longer-term weather events can move in from the Gulf of California to the south, and are often active in the summer monsoons. These include remnants of Pacific hurricanes, storms from the southern tropical jet stream, and the northern Inter Tropical Convergence Zone (ITCZ).

The arid nature of the region is demonstrated when historic annual average precipitation levels in Imperial County average 2.64" (**Figure 2-16)**. During the 12-month period prior to May 15, 2016 Imperial County recorded total annual precipitation of only 1.16 inches. Such arid conditions, as those preceding the event, result in soils that are particularly susceptible to particulate suspension by the elevated gusty winds.

FIGURE 2-16
IMPERIAL COUNTY HISTORICAL WEATHER

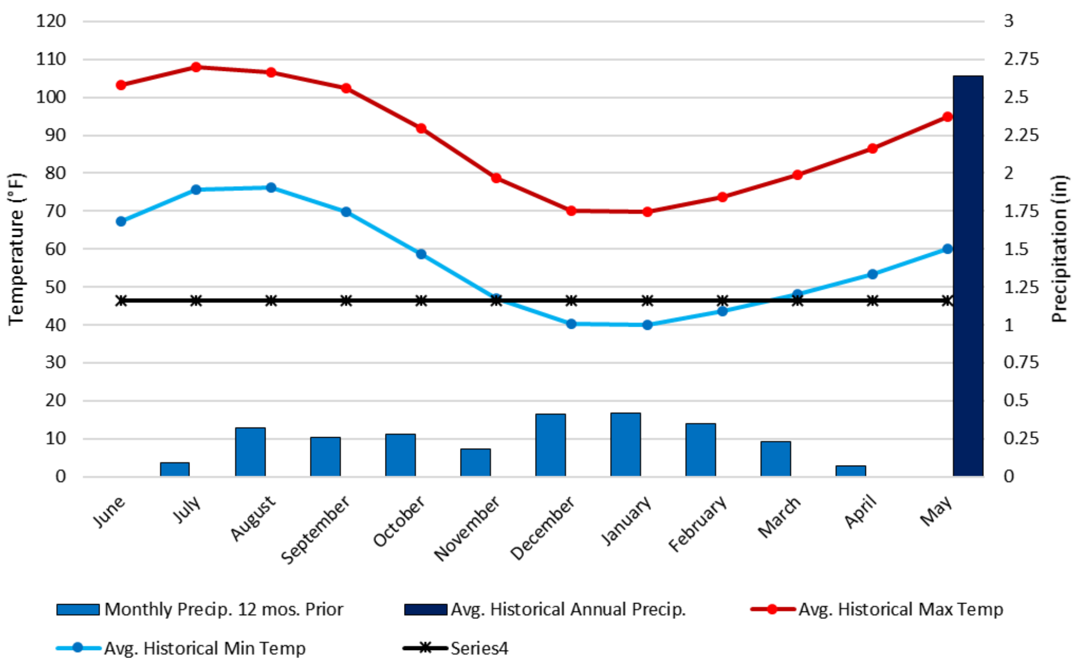


Fig 2-16: Historical Imperial County weather. Prior to May 15, 2016, the region had suffered abnormally low total precipitation of 1.16 inches in the 12 months prior. Average annual precipitation is 2.64 inches. Meteorological data courtesy of Western Regional Climate Center (WRCC) and Weather Underground http://www.wrcc.dri.edu/cgi-bin/climain.pl?ca2713

The NWS explains that the speed of any wind resulting from a weather system is directly proportional to the change in air pressure, called a pressure gradient, such that when the pressure gradient increases so does the speed of the wind.[4] Because the pressure gradient is just the difference in pressure between high and low-pressure areas, changes in weather patterns may recur seasonally.

Typically, high pressure brings clear skies and with no clouds there is more incoming shortwave solar radiation causing temperatures to rise. When surface winds become light, the cooling of the air produced directly under a high-pressure system can lead to a buildup of particulates in urban areas under an elongated region of relatively high atmospheric pressure or ridge causing widespread haze. Conversely, a trough is an elongated region of relatively low atmospheric pressure often associated with fronts. Troughs may be at the surface, or aloft under various conditions. Most troughs bring clouds, showers, and a wind shift, particularly following the passage of the trough.

While windblown dust events in Imperial County during the summer monsoon season are often due to outflow winds from thunderstorms, windblown dust events in the fall, winter, and spring are usually due to strong winds associated with low-pressure systems and cold fronts moving southeast across California. These winds are the result of strong surface pressure gradients between the approaching low-pressure system, accompanying cold front, and higher pressure ahead of it. As the low-pressure system and cold front approaches and passes, gusty southwesterly winds typically shift to northwesterly causing variable west winds. These strong winds entrain dust into the atmosphere and transport it over long distances, especially when soils are arid.

II.3 Event Day Summary

The exceptional event on May 15, 2016, which was caused by a Pacific weather system, with associated upper level trough, moved through the Pacific Northwest deepening as it moved east-southeast towards Arizona. As the Pacific low-pressure system deepened surface pressure gradients increased causing gusty westerly winds with measured wind speeds 50 to 60 mph within the San Diego mountain passes and desert slopes during the evening hours of May 14, 2016 and continued through May 15, 2016, affecting air quality in Imperial County and causing an exceedance at the Niland monitor.

Figures 2-17 through 2-19 provide information regarding the meteorological conditions that created conditions conducive to high winds across southeastern California and Imperial County. These images combined summarize the information regarding the timing, speed and direction of the winds.

[4] NWS JetStream – Origin of Wind http://www.srh.noaa.gov/jetstream/synoptic/wind.html

FIGURE 2-17
UPPER LEVEL TROUGH APPROACHES REGION

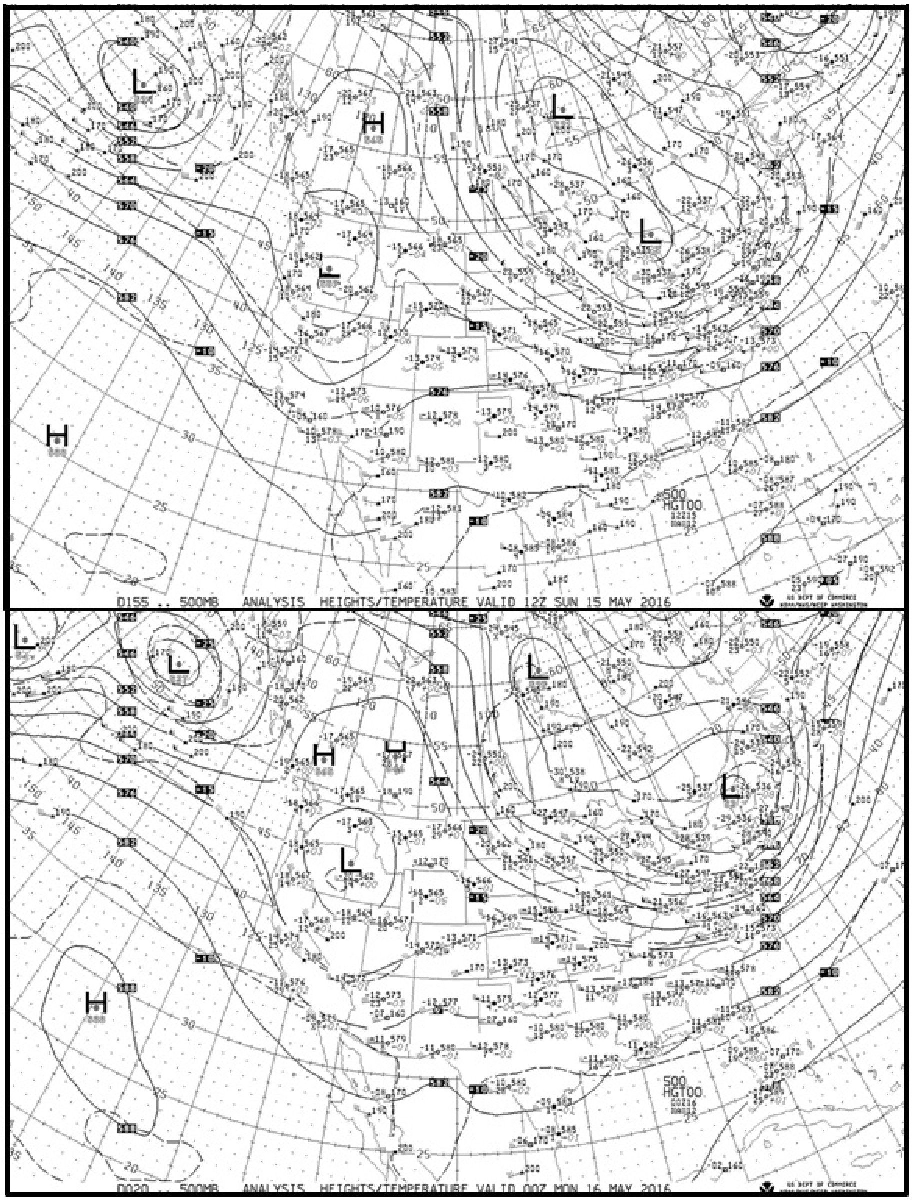


Fig 2-17: A pair of 500mb height maps showing the southeast movement of the upper level low and its trough over the Great Basin. The upper image is at 0400 PST May 15, 2016. By 1600 PST May 15, 2016 the low was moving over Idaho while the trough extended southward into southern California. Source: Colorado State University; http://archive.atmos.colostate.edu/data/misc/QHTA11/1605

FIGURE 2-18
SURFACE GRADIENT TIGHTENS

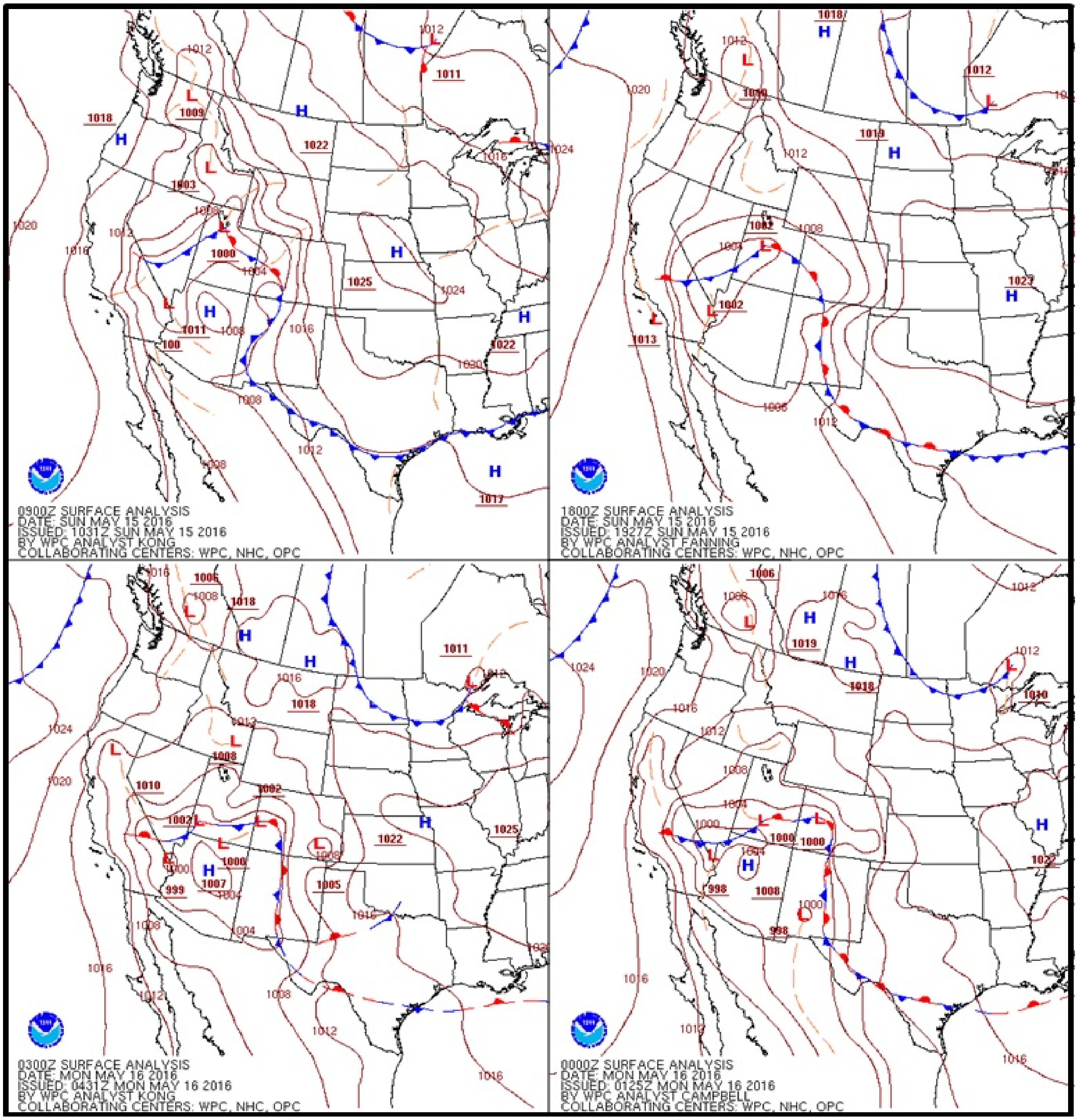


Fig 2-18: The upper level trough pushing through the region steered and strengthened a surface low over the tip of southern Nevada. This is turn caused the gradient at the surface to tighten. This led to strong gusty westerly winds across the mountains and deserts of southeastern California. A quad of surface analysis maps illustrates the tightening of the gradient over southern California. Clockwise, from top left: 0100; 1000; 1600; 1900 PST May 15, 2016. Source: NWS Weather Prediction Center Surface Analysis Archive

FIGURE 2-19
HIGH SURFACE WINDS

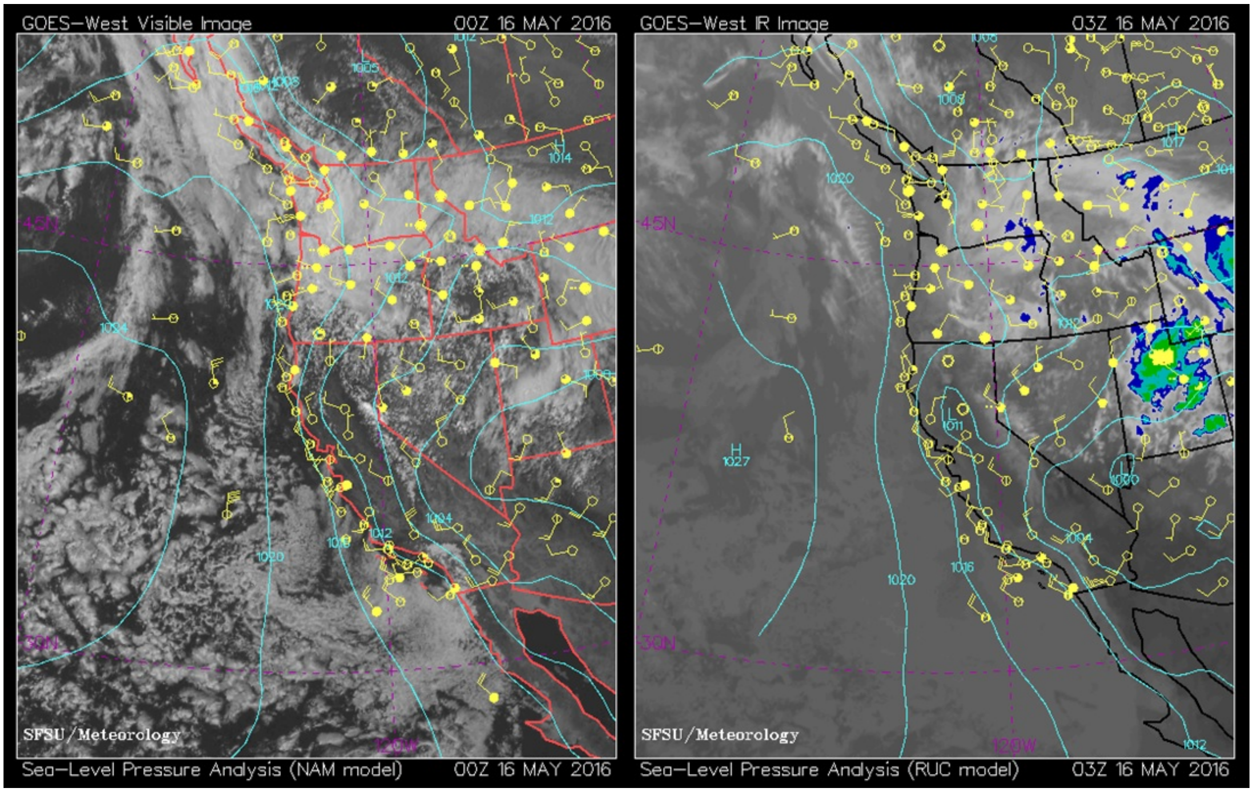


Fig 2-19: A pair of GOES-W visible (left) and infrared (right) satellite images captured at 1600 and 1900 PST on May 15, 2016. These times are coincident with the measured gusty winds, above 25 mph, at the Imperial County Airport and El Centro NAF. The wind barb within the right image at the El Centro NAF depicts westerly winds of at least 28.3 mph. In actuality, both airports reported winds above the 25mph threshold during the day. Source: SFSU Department of Earth & Climate Sciences and the California Regional Weather Server; http://squall.sfsu.edu/crws/archive/wcsathts_arch.html

The gusty westerly winds associated with the Pacific weather system prompted the San Diego NWS office to issue an Urgent Weather message with wind advisory as early as May 14, 2016. The wind advisory, issued for the deserts, forecasted 20 to 30 mph winds and gust up to 45 mph. The second wind advisory remained in effect through Sunday, May 15, 2016. **Figure 2-20** is a graphical illustration of the chain of events for May 15, 2015.

FIGURE 2-20
RAMP UP ANALYSIS FOR MAY 15, 2016

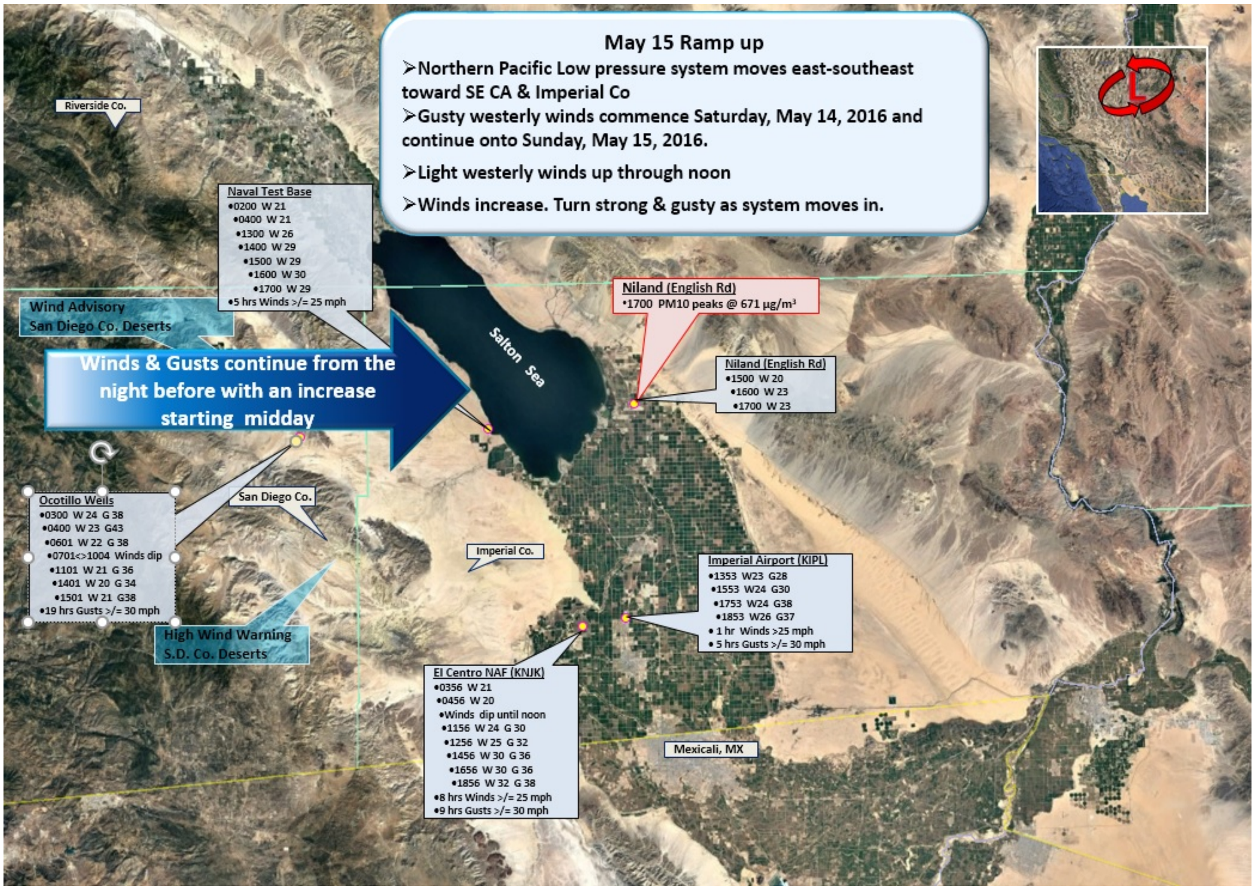


Fig 2-20: As the Pacific low-pressure system moved through the region winds and gusts began as early as Saturday, May 14, 2016 and continued onto Sunday, May 15, 2016. Winds remained moderate throughout the morning however by midday winds elevated and remained elevated for the remainder of the day. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system with Google Earth base map

Table 2-2 contains a summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, eastern Riverside County, Yuma County, Arizona, and Mexicali. For detailed meteorological station, graphs see **Appendix B**.

TABLE 2-2
WIND SPEEDS ON MAY 15, 2016

Station Monitor / Airport Meteorological Data	Maximum Wind Speed (WS) (mph)	Wind Direction during Max WS (degrees)	*Time of Max Wind Speed	24 hr Maximum Wind Gust (WG) (mph)	Time of Max WG	PM10 correlated to time of Max Wind Speed: Nlnd	Wstmd	Brw	ElC	Clx
IMPERIAL COUNTY										
Imperial Airport (KIPL)	26	260	18:53	38	17:53	494	112	214	191	59
Naval Air Facility (KNJK)	30	250	16:56	38	18:56	627	242	219	126	142
Calexico (Ethel St)	18	298	15:00	-	-	334	227	163	156	226
El Centro (9th Street)	16.9	261	16:00	-	-	627	242	219	126	142
Niland (English Rd)	23.3	250	17:00	-	-	671	411	186	97	104
Westmorland	16.7	282	18:00	-	-	494	112	214	191	59
RIVERSIDE COUNTY										
Blythe Airport (KBLH)	21	190	7:52	28	9:52	208	28	20	30	30
Palm Springs Airport (KPSP)	29	333	17:53	37	17:53	671	411	186	97	104
Jacqueline Cochran Regional Airport (KTRM) - Thermal	26	340	16:52	39	20:52	627	242	219	126	142
ARIZONA - YUMA										
Yuma MCAS (KNYL)	16	280	15:57	18	14:57	334	227	163	156	226
MEXICALI - MEXICO										
Mexicali Int. Airport (MXL)	26.5	290	18:46	-	-	494	112	214	191	59

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted

The National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT back trajectory models,[5] in **Figures 2-21 and 2-22** illustrate the general path of airflow eight hours and 24 hours prior to reaching the Niland station at 0800 and 1700 PST coincident with hourly peak concentrations measured at the Niland monitor during the am and pm hours on May 15, 2016. The trajectories illustrate the morning and afternoon airflow, when gusty westerly winds entrained fugitive windblown dust into Imperial County from two predominantly different directions. It should be noted that modeled winds differ may from local conditions.

A Pacific low-pressure system moving east-southeast from the Pacific Northwest, into the Northern Rockies tightened the surface gradients on May 14, 2016 and May 15, 2016 creating gusty westerly winds in southern California. Meteorological observations indicate that surface winds during the evening hours of May 14, 2016 and the morning hours of May 15, 2016 were primarily from a northwest direction while surface winds during the afternoon hours of May 15, 2016 were primarily from a west-southwest direction. Wind direction, specifically the difference between the am hours and the pm hours, is one of the factors that provides insight into the

[5] The Hybrid Single Particle Lagrangian Integrated Trajectory Model (**HYSPLIT**) is a computer model that is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. It is currently used to compute air parcel trajectories and dispersion or deposition of atmospheric pollutants. One popular use of HYSPLIT is to establish whether high levels of air pollution at one location are caused by transport of air contaminants from another location. HYSPLIT's back trajectories, combined with satellite images (for example, from NASA's MODIS satellites), can provide insight into whether high air pollution levels are caused by local air pollution sources or whether an air pollution problem was blown in on the wind The initial development was a result of a joint effort between NOAA and Australia's Bureau of Meteorology. Source: NOAA/Air Resources Laboratory, 2011.

reason why only the Niland monitor exceeded the NAAQS on May 15, 2016. Other factors include, stronger evening wind speeds May 14, 2016 and May 15, 2016, and location. Data used in the HYSPLIT model has a horizontal resolution of 12 km and is integrated every three hours. Thus, the HYSPLIT model may differ from local observed surface wind speeds and directions.

Tables 2-3, 2-4 and 5-1 provide relevant information regarding wind speeds, direction and impact to the air monitoring stations in Imperial County. Overall a Pacific weather system moving in an eastward direction had a greater affect upon the northern section of Imperial County as the system moved towards Arizona.

TABLE 2-3
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR MAY 14, 2016

EL CENTRO NAF (KNJK)				PALM SPRINGS (KSPS)				JACQUELINE COCHRAN (KTRM)				NILAND			NILD	WEST	BRAW	ELC	CALX
HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/D	PM_{10} (μg/m3)	PM_{10} (μg/m3)	PM_{10} (μg/m3)	PM_{10} (μg/m3)	PM_{10} (μg/m3)
56	0		0	53	3		160	52	9		320	0	5.7	152	25	43	37	33	25
156	7		280	153	3		110	152	9		310	100	6.6	123	25	42	42	22	23
256	9		280	253	5		180	252	14	22	320	200	6	154	24	35	20	21	31
356	7		350	353	3		240	352	6		330	300	5.4	107	23	41	22	21	42
456	5		60	453	5		VRB	452	5		20	400	7.4	118	24	29	17	24	37
556	6		20	553	0		0	552	8		330	500	4.4	105	33	49	36	52	40
656	7		90	653	3		VRB	652	5		270	600	3.2	96	26	57	53	35	82
756	6		90	753	0		0	752	8		340	700	5	135	61	40	31	32	62
856	6		VR	853	3		50	852	0		0	800	6.9	142	45	37	29	30	30
956	5		VR	953	5		VRB	952	0		0	900	5.3	134	26	21	27	21	21
1056	6		90	1053	0		0	1052	5		VRB	1000	4.8	134	31	21	24	25	22
1156	3		VR	1153	6		VRB	1152	7		90	1100	4.4	126	15	20	26	23	14
1256	3		VR	1253	18	24	320	1252	7		170	1200	2.8	161	18	22	20	19	13
1354	3		90	1353	22	29	330	1352	8		130	1300	3	186	19	19	16	18	20
1458	5		130	1453	20	31	320	1452	0		0	1400	5.6	189	27	9	13	19	26
1558	21		260	1553	23	32	320	1552	16		320	1500	7.5	184	14	15	10	29	84
1641	21		260	1653	22	31	310	1652	16		320	1600	8.4	186	22	103	87	85	76
1737	21		260	1753	23	31	320	1752	24	31	330	1700	14	163	144	349	387	53	48
1822	30		250	1853	23	34	320	1818	24	30	340	1800	12	177	539	854	654	84	51
								1852	25	33	340								
1956	23		260	1953	25		320	1952	22	33	340	1900	13.7	201	610	128	995	193	123
2056	16		250	2053	17	28	320	2052	26	36	330	2000	13.7	229	360	52	188	142	219
2156	18		250	2153	14	23	310	2110	25	36	330	2100	10.3	239	390	19	23	48	91
								2152	24	36	330								
2256	22		260	2253	7		270	2252	17	26	330	2200	4.1	259	194	7	16	24	20
2356	18		260	2353	0		0	2352	20	26	330	2300	11	268	261	22	11	28	21

Palm Springs predominant wind direction northwest for 10 hours; Jacqueline Cochran (Desert Resorts) predominant wind direction North, Northwest and North-Northwest for 12 hours. Airport wind data from the NCEI's QCLCD system. Niland station wind data is from the EPA's AQS data bank. Neither Niland nor the Naval Test Base measures wind gusts. Wind speeds = mph; Direction = degrees; VRB = Variable

TABLE 2-4
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR MAY 15, 2016

EL CENTRO NAF (KNJK)				PALM SPRINGS (KSPS)				JACQUELINE COCHRAN (KTRM)				NILAND			NILD	WEST	BRAW	ELC	CALX
HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/D	PM_{10} (µg/m3)	PM_{10} (µg/m3)	PM_{10} (µg/m3)	PM_{10} (µg/m3)	PM_{10} (µg/m3)
56	16		260	53	6		140	52	13		330	0	13	255	234	37	18	27	33
156	15		250	153	3		80	152	13		310	100	5	260	114	30	9	19	28
256	11		250	253	0		0	252	13	21	330	200	1	243	106	10	6	18	21
356	21		250	353	3		VRB	352	16	25	320	300	5	115	99	13	7	12	29
								438	23	34	330								
								449	20	30	320								
456	20		250	453	3		160	452	16	30	320	400	4	272	121	55	9	19	36
								503	13	22	320								
								526	20	24	330								
								541	14	23	310								
556	9		210	553	0		0	552	13	24	310	500	11	272	183	57	16	24	32
								605	17	24	310								
656	8		250	653	13	23	290	652	17	25	330	600	8	266	173	29	21	33	43
756	16		270	753	16	28	310	752	13	21	320	700	7	255	208	28	20	30	34
856	3		300	853	21	34	290	852	21	26	340	800	9	251	303	23	24	22	30
956				953				952	15		330	900	10	261	53	171	22	20	21
1056	17		250	1053	20	30	330	1052	21	29	330	1000	8	288	58	84	20	18	25
1156	24	30	240	1153	20	39	320	1152	18		330	1100	6	243	59	62	35	32	42
1256	25	32	250	1253	24	33	320	1252	22		330	1200	8	240	69	49	35	54	51
1354	26	32	250	1353	26	33	320	1352	24	30	330	1300	11	259	133	110	63	72	56
								1427	22	29	330								
1456	30	36	260	1453	24	32	320	1452	24	33	330	1400	17	261	270	147	128	78	175
								1535	23	32	340								
1556	32		260	1553	24	37	310	1552	25	32	330	1500	20	258	334	227	163	156	226
1656	30	36	250	1653	21	33	310	1652	26	34	340	1600	23	253	627	242	219	126	142
1756	23	31	250	1753	29	37	330	1752	22	34	330	1700	23	250	671	411	186	97	104
1856	32	38	260	1853	22	31	320	1852	23	34	330	1800	22	250	494	112	214	191	59
1956	29	36	270	1953	21	36	320	1952	24	34	330	1900	22	252	214	111	98	170	64
								2014	25	37	330								
								2018	23	37	330								
								2050	24	39	330								
2056	26	32	260	2053	21	30	320	2052	23	39	330	2000	21	252	139	69	68	73	36
2156	20		260	2153	15	24	310	2132	24	37	330	2100	18	258	144	206	13	106	25
								2152	24	37	340								
2256	23		260	2253	9	21	310	2252	25	32	330	2200	16	260	169	85	22	100	25
2356	24		250	2353	9	23	310	2352	22	33	340	2300	14	263	209	33	11	130	41

Palm Springs predominant wind direction northwest for 18 hours; Jacqueline Cochran (Desert Resorts) predominant wind direction Northwest and North-Northwest for 24 hours. Airport wind data from the NCEI's QCLCD system. Niland station wind data is from the EPA's AQS data bank. Neither Niland nor the Naval Test Base measures wind gusts. Wind speeds = mph; Direction = degrees; VRB = Variable

FIGURE 2-21
HYSPLIT MODEL EARLY MORNING MAY 15, 2016

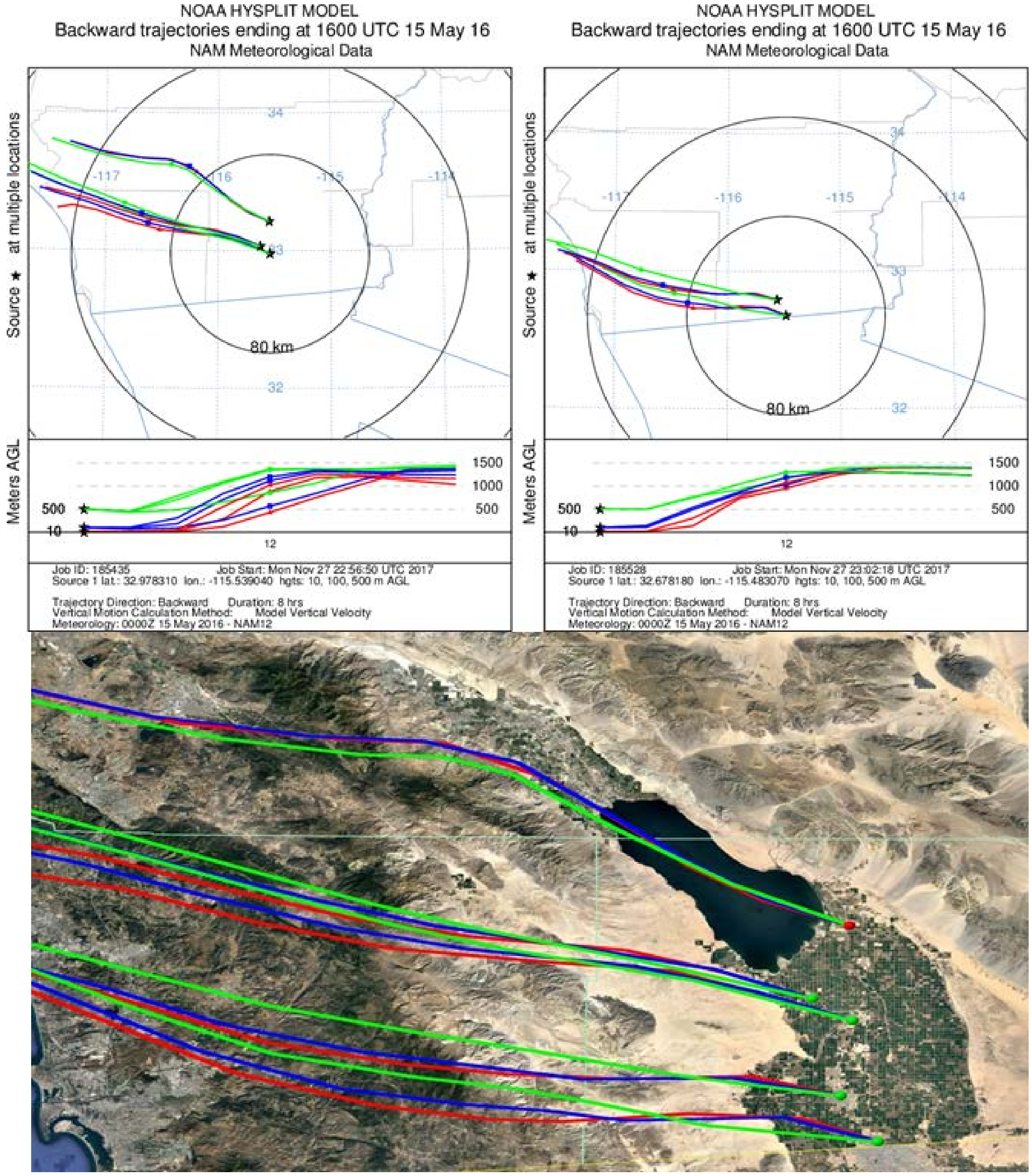


Fig 2-21: An 8-hour back trajectory ending at 0800 PST. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100m; green indicates airflow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

FIGURE 2-22
HYSPLIT MODEL AFTERNOON MAY 15, 2016

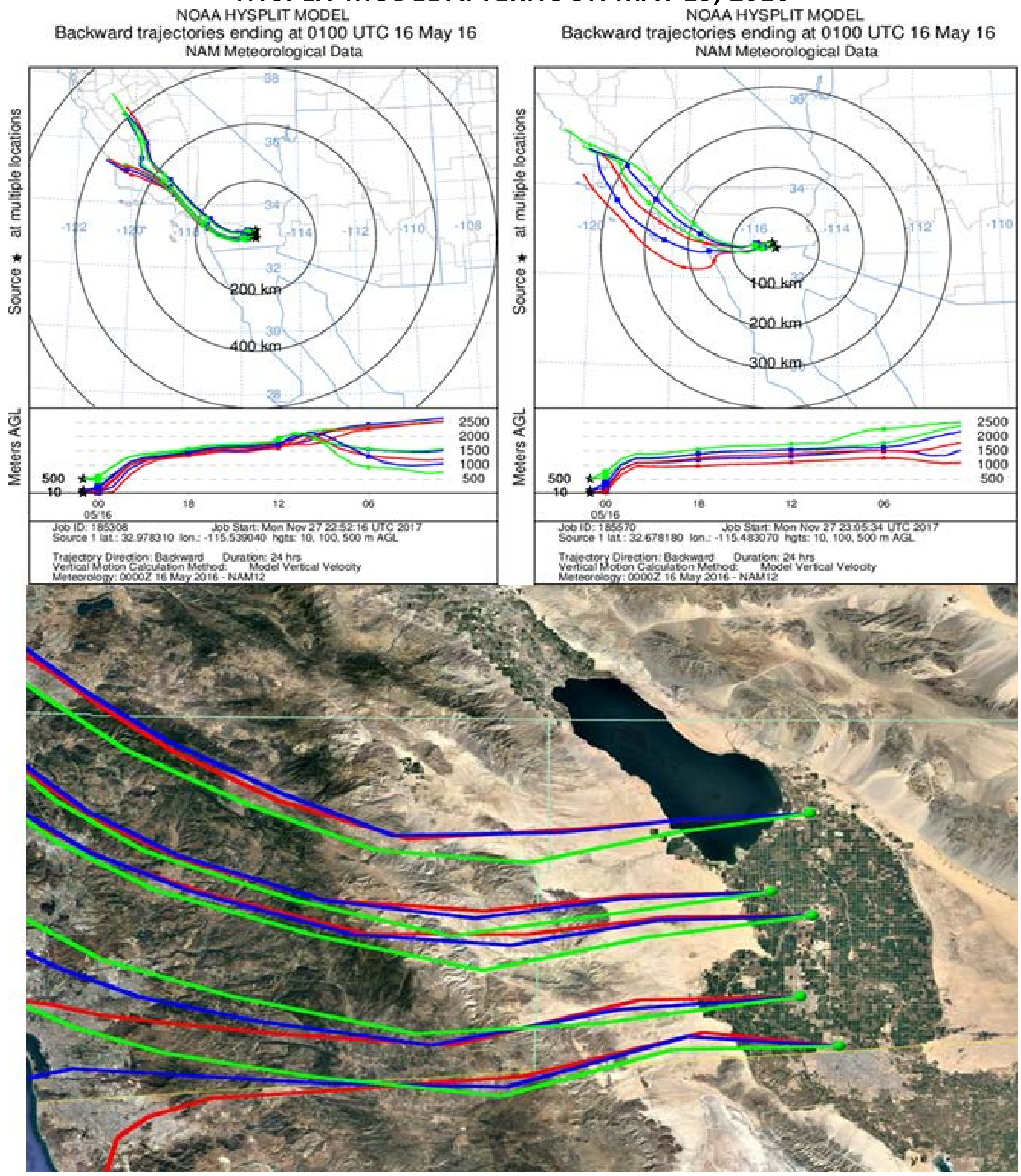


Fig 2-22: A 6-hour back trajectory ending at 1700 PST. Red trajectory indicates air flow at 10 meters AGL (above ground level); blue indicates air flow at 100m; green indicates air flow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figures 2-22 and 2-23 illustrate the elevated levels of winds and PM_{10} concentrations measured in eastern Riverside County, Imperial and Yuma Counties for a total of three days, May 14, 2016 through May 16, 2016. Elevated emissions entrained into Imperial County affected the Westmorland and Niland monitors when gusty westerly winds, associated with the passage of a Pacific weather system passed by Imperial County as early as the evening of May 14, 2016. **Tables 2-3, 2-4 and 5-1** provide hourly wind measurements above 25mph. The greatest impact was measured at the monitor located at the northern most portion of Imperial County, Niland consistent with the direction of the movement of the Pacific weather system.

The resulting entrained dust and accompanying high winds from the system qualify this event as a "high wind dust event".[6] High wind dust events are considered natural events where the windblown dust is either from solely a natural source or from areas where anthropogenic sources of windblown dust are controlled with Best Available Control Measures (BACM). The following sections provide evidence that the May 15, 2016 high wind event qualifies as a natural event and that BACM was overwhelmed by the suddenness and intensity of the meteorological event.

FIGURE 2-23
72-HOUR WIND SPEEDS REGIONAL SITES

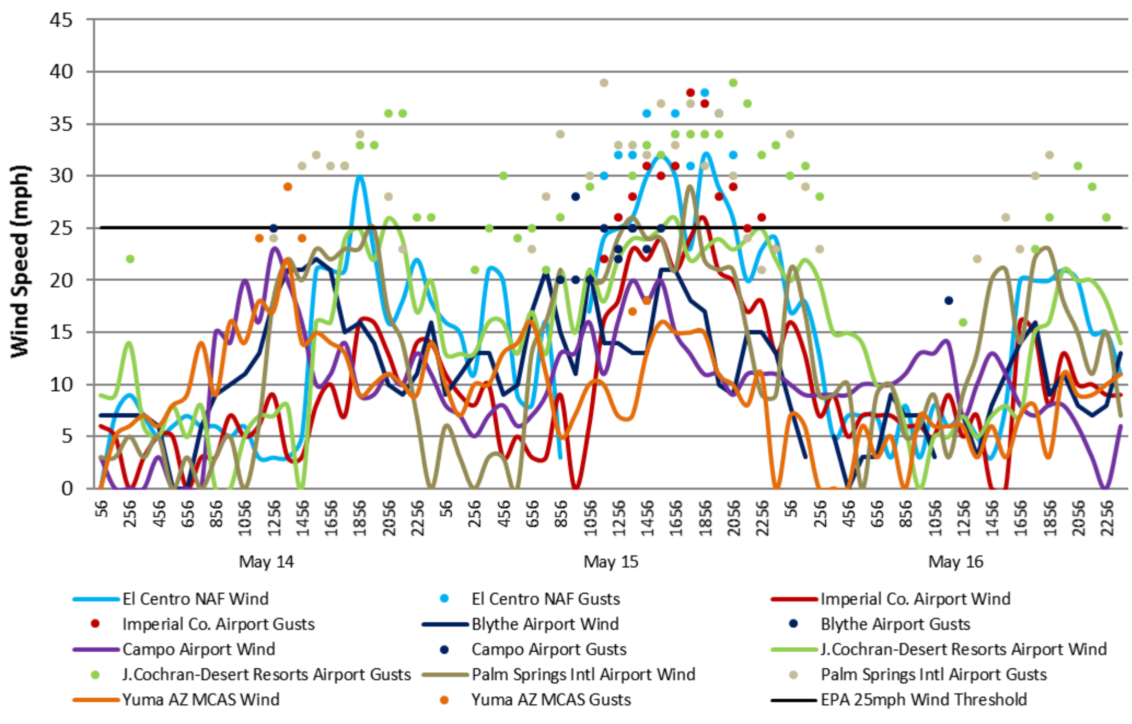


Fig 2-23: The regional effect of the high winds is reflected by the jump in wind speeds at airports as early as the evening hours of May 14, 2016. Imperial County Airport and El Centro NAF had winds above the 25 mph threshold. Wind Data from the NCEI's QCLCD system

[6] Title 40 Code of Federal Regulations part 50: §50.1(p) High wind dust event is an event that includes the high-speed wind and the dust that the wind entrains and transports to a monitoring site.

FIGURE 2-24
72-HOUR PM_{10} CONCENTRATIONS AT VARIOUS SITES

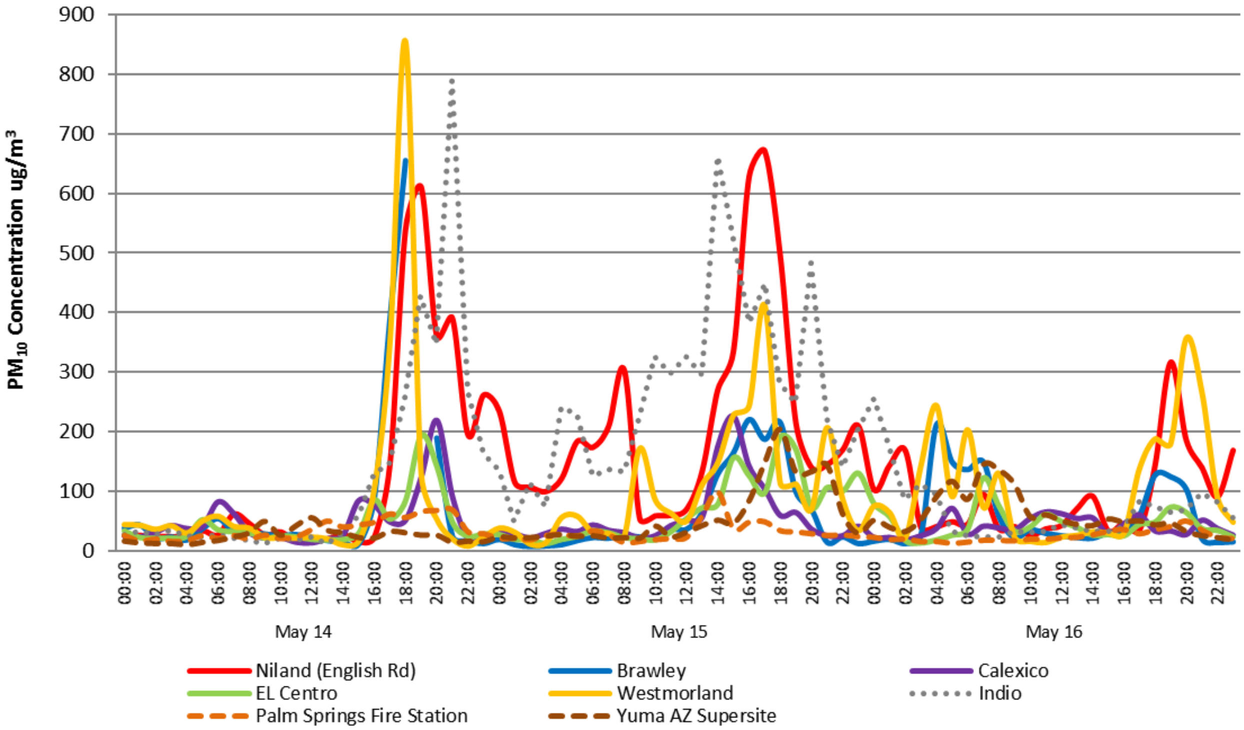


Fig 2-24: Is the graphical representation of the 72 hour relative PM_{10} concentrations at various sites in California and Arizona. The elevated PM_{10} concentrations at nearly all sites on May 15, 2016, demonstrate the regional impact of the weather system and accompanying winds. Air quality data from the EPA's AQS data bank.

III Historical Concentrations

III.1 Analysis

While naturally occurring high wind events may recur seasonally and at times frequently and qualify for exclusion under the EER, historical comparisons of the particulate concentrations and associated winds provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM_{10} concentrations measured at the Niland monitor on May 15, 2016, were compared to non-event and event days demonstrating the variability over several years and seasons. The analysis, also, provides supporting evidence that there exists a clear causal relationship between the May 15, 2016 high wind event and the exceedance measured at the Niland monitor.

Figures 3-1 through 3-2 show the time series of available FRM and BAM 24-hr PM_{10} concentrations at the Niland station for the period of January 1, 2010 through May 15, 2016. Note that prior to 2013, the BAM data was not considered FEM and was not reported into AQS.[7] In order to properly establish the variability of the event as it occurred on May 15, 2016, 24-hour averaged PM_{10} concentrations between January 1, 2010 and May 15, 2016 were compiled and plotted as a time series. All four figures illustrate that the exceedance, which occurred on May 15, 2016, were outside the normal historical concentrations when compared to event and non-event days. Air quality data for all graphs was obtained through the EPA's AQS data bank.

[7] Pollutant concentration data contained in EPA's Air Quality System (AQS) are required to be reported in units corrected to standard temperature and pressure (25 C, 760 mm Hg). Because the PM_{10} concentrations prior to 2013 were not reported into the AQS database all BAM (FEM) data prior to 2013 within this report are expressed as micrograms per cubic meter (mg/m3) at local temperature and pressure (LTP) as opposed to standard temperature and pressure (STP, 760 torr and 25 C). The difference in concentration measurements between standard conditions and local conditions is insignificant and does not alter or cause any significant changes in conclusions to comparisons of PM_{10} concentrations to PM_{10} concentrations with in this demonstration.

FIGURE 3-1
NILAND HISTORICAL
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO MAY 15, 2016

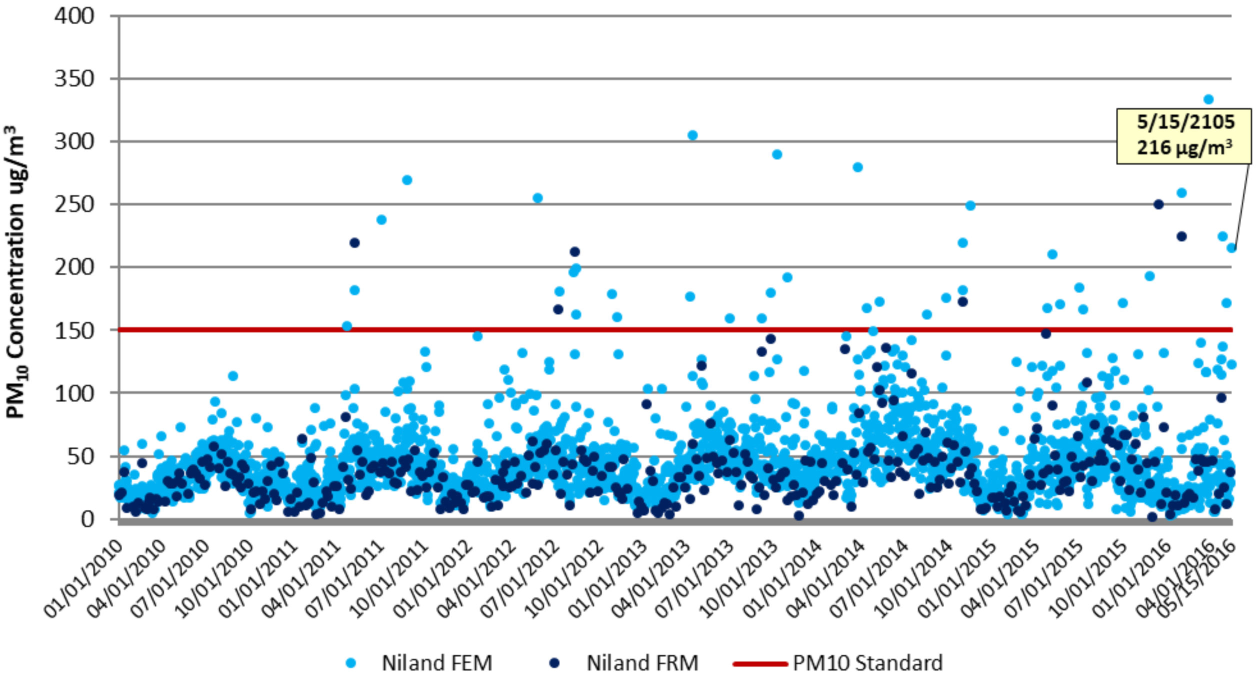
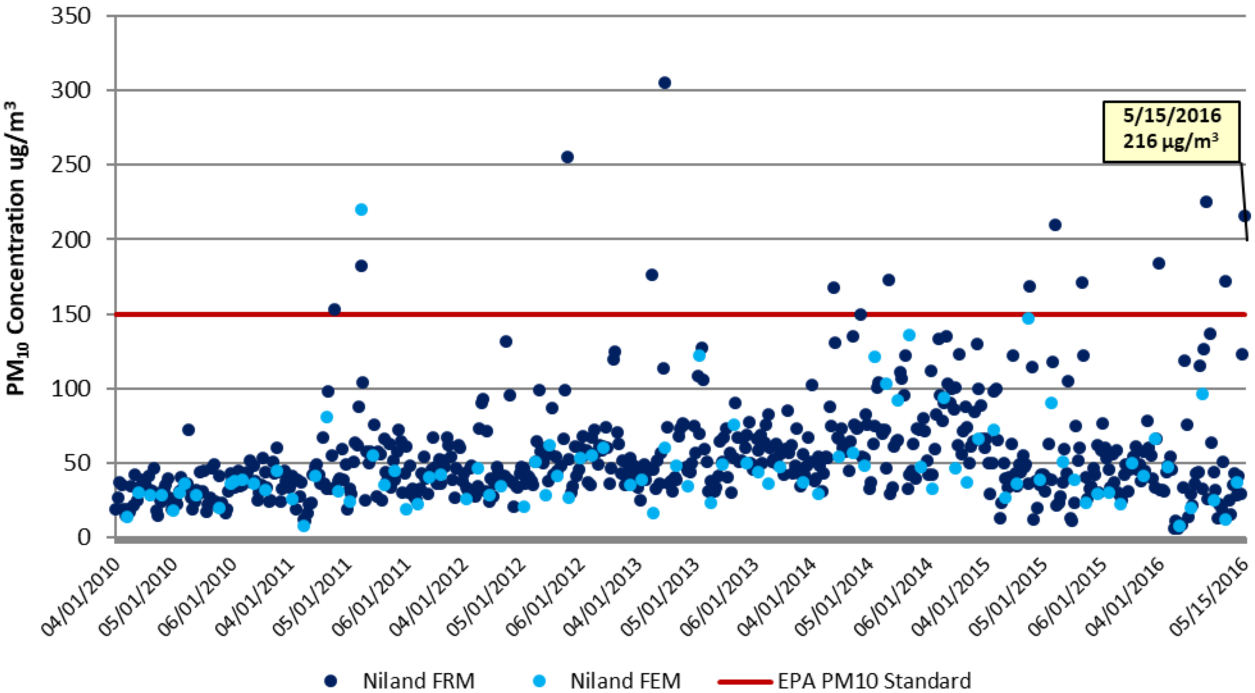


Fig 3-1: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 216 µg/ by the Brawley BAM 1020 PM_{10} monitor was outside the normal historical concentrations when compared to similar days and non-event days. The far vast number of samples fall way below the exceedance threshold

The time series, **Figure 3-1** for Niland, included 2,327 sampling days (January 1, 2010 through May 15, 2016). During this period the Brawley station recorded 2,693 credible samples, measured by either FRM or FEM monitors between January 1, 2010 and May 15, 2016. Overall, the time series illustrates that of the 2,693 credible samples measured during there was a total of 42 exceedance days, which is a 1.6% occurrence rate.

FIGURE 3-2
NILAND SEASONAL COMPARISON
PM_{10} 24-HR AVG CONCENTRATIONS
***APRIL 1, 2010 THROUGH MAY 15, 2016**



***April 1, 2010 to June 30, 2015 and April 1, 2016 to May 15, 2016**

Fig 3-3: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentration of 216 µg/m^3 by the Brawley BAM 1020 PM_{10} monitor was outside the normal seasonal concentrations when compared to similar days and non-event days. The far vast number of samples fall way below the exceedance threshold

Figures 3-2 displays the seasonal fluctuations over 591 sampling days at the Niland station for months April through June of years 2010 through 2016 (2016 ending May 15). The seasonal sampling period for Niland contains 683 combined FRM and FEM credible samples. Of these, there were only 16 exceedance days, or just 2.3% of all samples.

Figure 3-3 graphically represents the percentile ranking for Niland over the historical period of January 1, 2010 through May 15, 2016.

FIGURE 3-3
NILAND HISTORICAL
FRM & FEM PM_{10} 24 HR CONCENTRATIONS
JANUARY 1, 2010 TO MAY 15, 2016

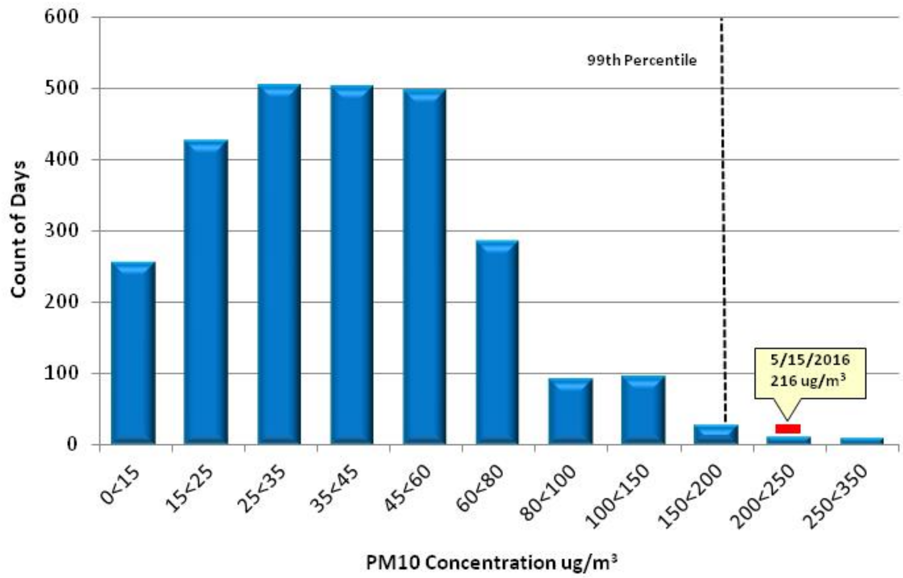


Fig 3-3: The 24-hr average PM_{10} concentration at the Niland monitoring site demonstrates that the concentration of 216 µg/m^3 falls above the 99th percentile.

For the combined FRM and FEM data sets, the annual historical and the seasonal historical PM_{10} concentration of 216 µg/m^3 for Niland is above the 99th percentile ranking. Looking at the annual time series concentrations, the seasonal time series concentrations, and the percentile rankings for both the historical and seasonal patterns, the May 15, 2016 measured exceedance is clearly outside the normal concentration levels when comparing to non-event days and event days.

III.2 Summary

The information provided, above, by the time series plots, seasonal time series plots, and the percentile rankings illustrate that the PM_{10} concentration observed on May 15, 2016 occurs infrequently. When comparing the measured PM_{10} levels on May 15, 2016 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedances measured at the Niland monitoring site was outside the normal historical and seasonal historical concentration levels.

The historical concentration analysis provided here supports the determination that the May 15, 2016 natural event affected the concentrations levels at the Niland monitor causing an exceedance. The concentration analysis further supports that the natural event affected air quality in such a way that there exists a clear causal relationship between the measured exceedances on May 15, 2016 and the natural event, qualifying the natural event as an Exceptional Event.

IV Not Reasonably Controllable or Preventable

According to the October 3, 2016 promulgated revision to the Exceptional Event (EE) rule under 40 CFR §50.14(b)(8) air agencies must address the “not reasonably controllable or preventable” (nRCP) criterion as two prongs. In order to properly address the nRCP criterion the ICAPCD must not only identify the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance but must identify the relevant State Implementation Plan (SIP) measures and/or other enforceable control measures in place for the identified sources. An effective analysis of the nRCP must include the implementation status of the control measures in order to properly consider the measures as enforceable. USEPA considers control measures to be enforceable if approved into the SIP within 5 years of an EE demonstration submittal. The identified control measures must address those specific sources that are identified as causing or contributing to a monitored exceedance.

The final EE rule revision explains that an event is considered not reasonably controllable if reasonable measures to control the impact of the event on air quality were applied at the time of the event. Similarly, an event is considered not reasonably preventable if reasonable measures to prevent the event were applied at the time of the event. However, for “high wind events” when PM_{10} concentrations are due to dust raised by high winds from desert areas whose sources are controlled with Best Available Control Measures (BACM) then the event is a “natural event” where human activity plays little or no direct causal role and thus is considered not preventable.

This section begins by providing background information on all SIP and other enforceable control measures in force during the EE for May 15, 2016. In addition, this May 15, 2016 demonstration provides technical and non-technical evidence that strong and gusty westerly winds blew across the mountains and deserts within southeastern California and into Imperial County suspending particulate matter affecting the Brawley and Westmorland monitors on May 15, 2016. This section identifies all natural and anthropogenic sources and provides regulatory evidence of the enforceability of the control measures in place during the May 15, 2016 EE.

IV.1 Background

Inhalable particulate matter (PM_{10}) contributes to effects that are harmful to human health and the environment, including premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function, visibility impairment, and damage to vegetation and ecosystems. Upon enactment of the 1990 Clean Air Act (CAA) amendments, Imperial County was classified as moderate nonattainment for the PM_{10} NAAQS under CAA sections 107(d)(4)(B) and 188(a). By November 15, 1991, such areas were required to develop and submit State Implementation Plan (SIP) revisions providing for, among other things, implementation of reasonably available control measures (RACM).

Partly to address the RACM requirement, ICAPCD adopted local Regulation VIII rules to control PM_{10} from sources of fugitive dust on October 10, 1994, and revised them on November 25, 1996. USEPA did not act on these versions of the rules with respect to the federally enforceable SIP.

On August 11, 2004, USEPA reclassified Imperial County as a serious nonattainment area for PM_{10}. As a result, CAA section 189(b)(1)(B) required all BACM to be implemented in the area within four years of the effective date of the reclassification, i.e., by September 10, 2008.

On November 8, 2005, partly to address the BACM requirement, ICAPCD revised the Regulation VIII rules to strengthen fugitive dust requirements. On July 8, 2010, USEPA finalized a limited approval of the 2005 version of Regulation VIII, finding that the seven Regulation VIII rules largely fulfilled the relevant CAA requirements. Simultaneously, USEPA also finalized a limited disapproval of several of the rules, identifying specific deficiencies that needed to be addressed to fully demonstrate compliance with CAA requirements regarding BACM and enforceability.

In September 2010, ICAPCD and the California Department of Parks and Recreation (DPR) filed petitions with the Ninth Circuit Federal Court of Appeals for review of USEPA's limited disapproval of the rules. After hearing oral argument on February 15, 2012, the Ninth Circuit directed the parties to consider mediation before rendering a decision on the litigation. On July 27, 2012, ICAPCD, DPR and USEPA reached agreement on a resolution to the dispute which included a set of specific revisions to Regulation VIII. These revisions are reflected in the version of Regulation VIII adopted by ICAPCD on October 16, 2012 and approved by USEPA April 22, 2013. Since 2006 ICAPCD had implemented regulatory measures to control emissions from fugitive dust sources and open burning in Imperial County.

FIGURE 4-1
REGULATION VIII GRAPHIC TIMELINE DEVELOPMENT

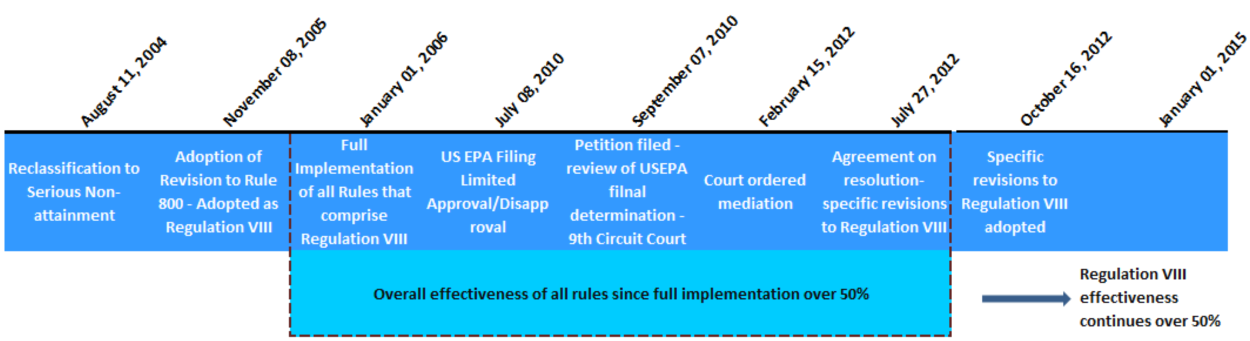


Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

A brief summary of Regulation VIII which is comprised of seven fugitive dust rules is found below. **Appendix D** contains a complete set of the Regulation VIII rules.

ICAPCD's Regulation VIII consists of seven interrelated rules designed to limit emissions of PM_{10} from anthropogenic fugitive dust sources in Imperial County.

Rule 800, General Requirements for Control of Fine Particulate Matter, provides definitions, a compliance schedule, exemptions and other requirements generally applicable to all seven rules. It requires the United States Bureau of Land Management (BLM), United States Border Patrol (BP) and DPR to submit dust control plans (DCP) to mitigate fugitive dust from areas and/or activities under their control. Appendices A and B within Rule 800 describe methods for determining compliance with opacity and surface stabilization requirements in Rules 801 through 806.

Rule 801, Construction and Earthmoving Activities, establishes a 20% opacity limit and control requirements for construction and earthmoving activities. Affected sources must submit a DCP and comply with other portions of Regulation VIII regarding bulk materials, carry-out and track-out, and paved and unpaved roads. The rule exempts single family homes and waives the 20% opacity limit in winds over 25 mph under certain conditions.

Rule 802, Bulk Materials, establishes a 20% opacity limit and other requirements to control dust from bulk material handling, storage, transport and hauling.

Rule 803, Carry-Out and Track-Out, establishes requirements to prevent and clean-up mud and dirt transported onto paved roads from unpaved roads and areas.

Rule 804, Open Areas, establishes a 20% opacity limit and requires land owners to prevent vehicular trespass and stabilize disturbed soil on open areas larger than 0.5 acres in urban areas, and larger than three acres in rural areas. Agricultural operations are exempted.

Rule 805, Paved and Unpaved Roads, establishes a 20% opacity limit and control requirements for unpaved haul and access roads, canal roads and traffic areas that meet certain size or traffic thresholds. It also prohibits construction of new unpaved roads in certain circumstances. Single-family residences and agricultural operations are exempted.

Rule 806, Conservation Management Practices, requires agricultural operation sites greater than 40 acres to implement at least one conservation management practice (CMP) for each of several activities that often generates dust at agricultural operations. In addition, agricultural operation sites must prepare a CMP plan describing how they comply with Rule 806, and must make the CMP plan available to the ICAPCD upon request.

IV.1.b Additional Measures

Imperial County Natural Events Action Plan (NEAP)

On August 2005, the ICAPCD adopted a NEAP for the Imperial County, as was required under the former USEPA Natural Events Policy, to address PM_{10} events by:

- Protecting public health;
- Educating the public about high wind events;
- Mitigating health impacts on the community during future events; and
- Identifying and implementing BACM measures for anthropogenic sources of windblown dust.

Smoke Management Plan (SMP) Summary

There are 35 Air Pollution Control Districts or Air Quality Management Districts in California which are required to implement a district-wide smoke management program. The regulatory basis for California's Smoke Management Program, codified under Title 17 of the California Code of Regulations is the "Smoke Management Guidelines for Agricultural and Prescribed Burning" (Guidelines). California's 1987 Guidelines were revised to improve interagency coordination, avoid smoke episodes, and provide continued public safety while providing adequate opportunity for necessary open burning. The revisions to the 1987 Guidelines were approved March 14, 2001. All air districts, with the exception of the San Joaquin Valley Air Pollution Control District (SJAPCD) were required to update their existing rules and Smoke Management Plans to conform to the most recent update to the Guidelines.

Section 80150 of Title 17 specifies the special requirements for open burning in agricultural operations, the growing of crops and the raising of fowl or animals. This section specifically requires the ICAPCD to have rules and regulations that require permits that contain requirements that minimize smoke impacts from agricultural burning.

On a daily basis, the ICAPCD reviews surface meteorological reports from various airport agencies, the NWS, State fire agencies and CARB to help determine whether the day is a burn day. Using a four quadrant map of Imperial County allowed burns are allocated in such a manner as to assure minimal to no smoke impacts safeguarding the public health. Finally, all permit holders are required to notice and advise members of the public of a potential burn. This noticing requirement is known as the Good Neighbor Policy. On May 15, 2016 the ICAPCD declared a No Burn day **(Appendix A).** No complaints were filed for agricultural burning on May 15, 2016.

IV.1.c Review of Source Permitted Inspections and Public Complaints

A query of the ICAPCD permit database was compiled and reviewed for active permitted sources throughout Imperial County and specifically around Westmorland and Brawley during the May 15, 2016 PM_{10} exceedance. Both permitted and non-permitted sources are required to comply with Regulation VIII requirements that address fugitive dust emissions. The identified permitted sources are Aggregate Products, Inc., US Gypsum Quarry, Imperial Aggregates (Val-Rock, Inc., and Granite Construction), US Gypsum Plaster City, Clean Harbors (Laidlaw Environmental Services), Bullfrog Farms (Dairy), Burrtec Waste Industries, Border Patrol Inspection station, Centinela State Prison, various communications towers not listed and various agricultural operations. Non-permitted sources include the wind farm known as Ocotillo Express, and a solar facility known as

CSolar IV West. Finally, the desert regions are under the jurisdiction of the Bureau of Land Management and the California Department of Parks (Including Anza Borrego State Park and Ocotillo Wells).

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions. May 15, 2016 was officially designated as a No Burn day. No complaints were filed on May 15, 2016 related either to agricultural or waste burning or dust.

FIGURE 4-2
PERMITTED SOURCES

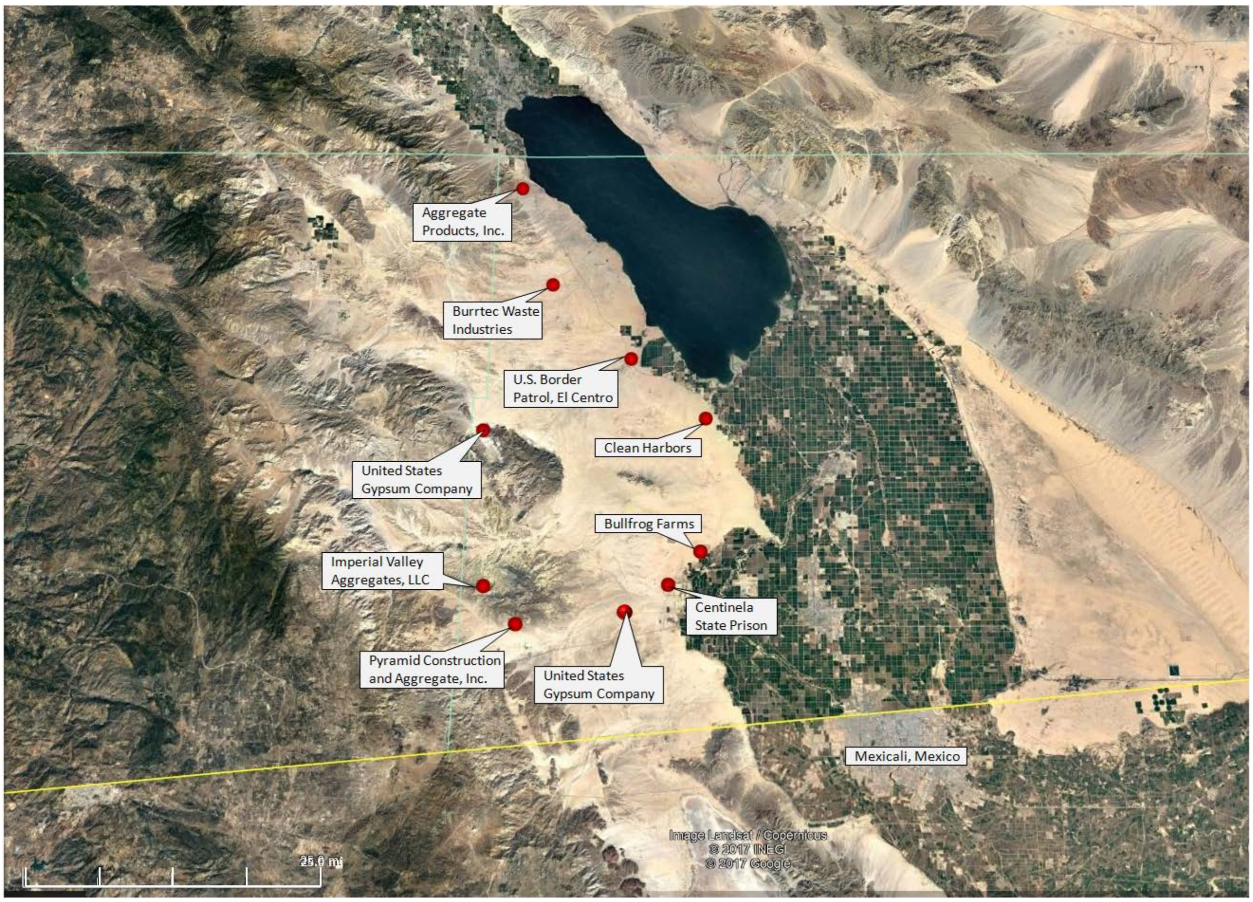


Fig 4-2: The above map identifies those permitted sources located west, northwest and southwest of the Niland monitor. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the United States and Mexico. The green checker-boarded areas are a mixed use of agricultural and community parcels. In addition, either the Bureau of Land Management or the California Department of Parks manages the desert areas. Base map from Google Earth

FIGURE 4-3
NON-PERMITTED SOURCES

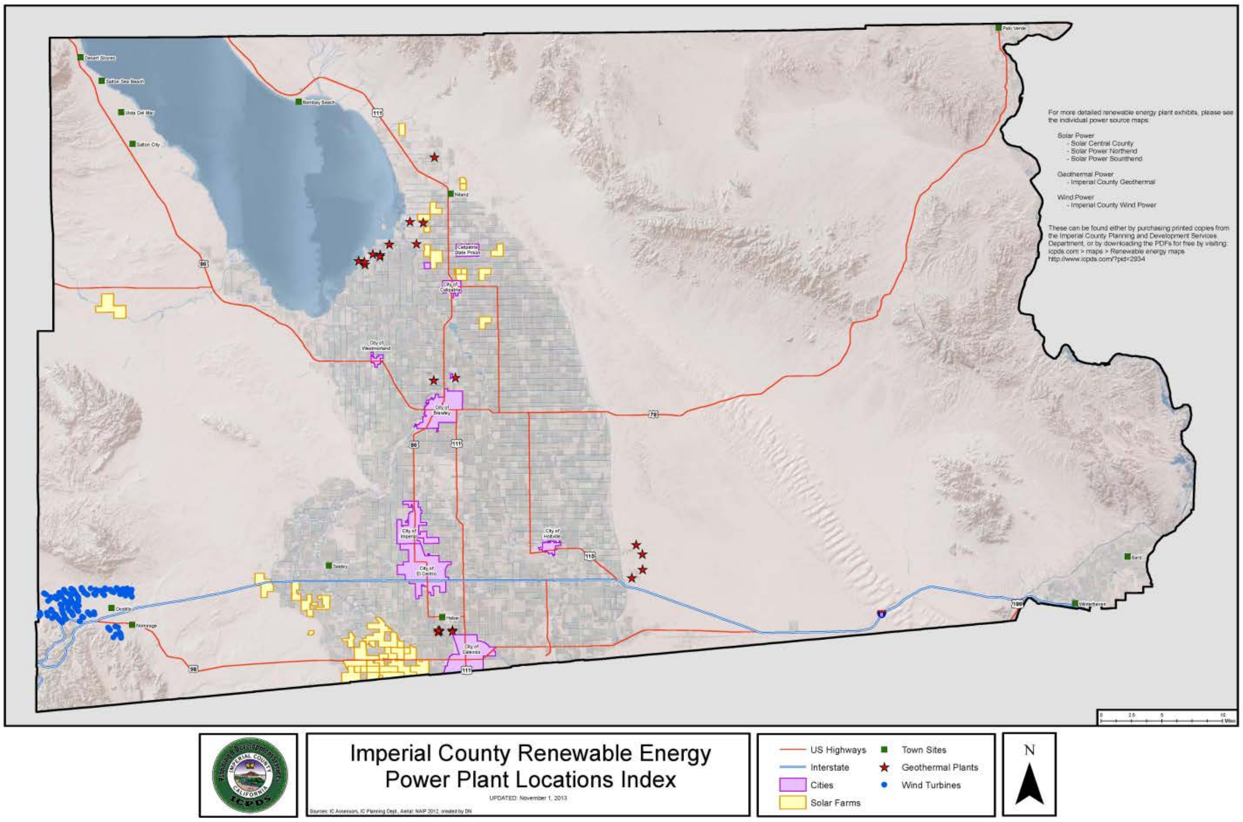


Fig 4-3: The above map identifies those power sources located west, northwest and southwest of the Brawley monitor. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants

IV.2 Forecasts and Warnings

The ICAPCD posted the National Weather Service (NWS) forecast as an extended weekend notification via the ICAPCD's webpage on Friday, May 13, 2016. The notice advised the public that a Pacific weather system would move into the western states as early as Saturday, May 14, 2016. The Pacific weather system and associated trough would deepen through Sunday, May 15, 2016 creating gusty westerly winds over the mountains and deserts from late Saturday through Monday morning.

Unlike the Phoenix NWS office, the San Diego NWS office issued two Urgent Weather messages that included wind advisories. The first wind advisory issued at 3:14am PST Saturday, May 14, 2016 was followed by a second wind advisory issued at 2:40am PST Sunday, May 15, 2016. Both wind advisories advised of west winds 20 to 30 mph with gusts to 50 mph and isolated gusts to 60 mph. The second wind advisory expired Monday, May 16, 2016 during the early morning hours.

In addition, wind advisories were issued for the San Bernardino County mountains, the Riverside County mountains, the Coachella Valley, and the San Diego County mountains and deserts that were immediately upstream of Imperial County (**Appendix A**).

IV.3 Wind Observations

Wind data during the event were collected from airports in Riverside County, San Diego County, Yuma County (Arizona), northern Mexico, and Imperial County. Data were also collected from automated meteorological instruments that were upstream from the Niland monitoring station during the wind event.

Because there was a northerly wind impact component that affected Imperial County monitors, during the evening hours of May 14, 2016 and during the early morning hours of May 15, 2016, it is appropriate to mention those Riverside airports that illustrate the wind speed and direction. As early as the evening hours of May 14, 2016 both the Palm Springs airport (KPSP) and the Jacquelin Cochran (Desert Resorts) airport (KTRM) measured elevated wind speeds and wind gusts for 9 to 10 hours (**Tables 2-3 and 2-4**). Winds were predominately in a north, north-west direction that did not change through May 15, 2016. Both airports measured 3-6 hours at or above the 25mph threshold, May 14, 2016 and May 15, 2016.

Locally, the El Centro NAF (KNJK) measured eight hours of winds at or above the 25 mph threshold. Imperial County Airport (KIPL) measured one hour of winds at or above the 25 mph threshold. The upstream location at the (former) Naval Test Base measured six hours of winds at or above 25 mph consistent with the Riverside airports. Wind speeds of 25 mph are normally sufficient to overcome most PM_{10} control measures. During the May 15, 2016 event wind speeds were above the 25 mph threshold, overcoming the BACM in place.

IV.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that high winds accompanying a strong low pressure system that moved through southern California lofted dust that caused uncontrollable PM_{10} emissions. The BACM list as part of the control measures in Imperial County for fugitive dust emissions were in place at the time of the event. These control measures are required for areas designated as "serious" non-attainment for PM_{10}, such as Imperial County. Thus, the BACM in place at the time of the event were beyond reasonable. In addition, surface wind measurements at or upstream of the Niland monitoring station during the event were high enough (at or above 25 mph, with wind gusts of 46 mph) that BACM PM_{10} control measures would have been overwhelmed.

Finally, a high wind dust event can be considered as a natural event, even when portions of the wind-driven emissions are anthropogenic, as long as those emissions have a clear causal relationship to the event and were determined to be not reasonably controllable or preventable. This demonstration has shown that the event that occurred on May 15, 2016 was not reasonably controllable or preventable despite the strong and in force BACM within the affected areas in

Imperial County. This demonstration has similarly established a clear causal relationship between the exceedances and the high wind event timeline and geographic location. The May 15, 2016 event can be considered an exceptional event under the requirements of the exceptional event rule.

V Clear Causal Relationship

V.1 Discussion

As mentioned above, meteorological observations for May 15, 2016, identified a Pacific weather system, with associated upper level trough, that moved through the Pacific Northwest deepening as it moved east-southeast into the Northern Rockies towards Arizona. The deepening caused a tightening of the surface pressure gradients that brought gusty westerly winds across the San Diego mountain passes and desert slopes as early as the evening hours of May 14, 2016 that continued into May 15, 2016.

In any event, entrained windblown dust from natural areas, particularly from the desert areas northwest and west of the Niland monitor, along with anthropogenic sources controlled with BACM, is supported by the meteorological and air quality observations on May 15, 2016. The Pacific weather system brought predominantly northwest winds during the evening hours of May 14, 2016 and during the morning hours of May 15, 2016 (**Figures 2-21 and 2-22**) which affected the Niland monitor more significantly than the Westmorland, Brawley, El Centro or the Calexico monitors. With the shift in wind direction by the afternoon hours of May 15, 2016 to a more southwest direction air quality was much more affected in the far northern section of Imperial County than in the southern section of Imperial County. The nature of the impact from the Pacific weather system is most evident by the Urgent Weather messages issued only by the San Diego NWS office and not the Phoenix NWS office. Two Urgent Weather messages were issued, each containing wind advisories, one as early as 3:14am PST on May 14, 2016 with forecasted elevated winds sufficient to cause blowing dust and sand reducing visibility. Dust in the air is supported by NOAA's Smoke Text Product, which identified light density blowing sand and dust moving eastward from the Anza Borrego Desert State Park across the Salton Sea into southwest Arizona.

The second issued Urgent Weather message at 2:40 PST May 15, 2016 contained a high wind advisory effective through 4:00am PST Monday, May 16, 2016. The San Diego NWS office explained that the winds during the evening hours of May 14, 2016 would be stronger and more widespread, supporting the greater affect upon the northern section of Imperial County.

Figures 5-1 and 5-2 show the packed surface gradient over southern and southeastern California on May 15. This created a strong onshore flow and resulted in high winds across southeastern California.

FIGURE 5-1
SURFACE PRESSURE GRADIENT PACKED

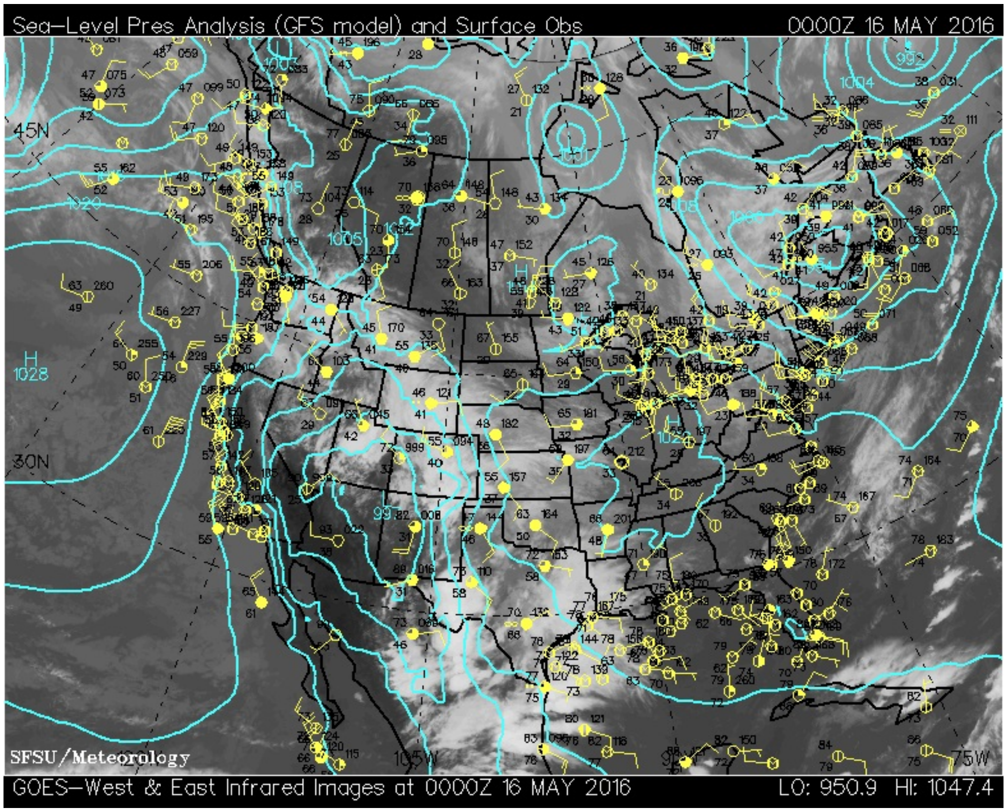


Fig 5-1: A GOES E-W infrared image shows the pressure gradient packed over southern and southeastern California at 1600 PST on May 15. This was during the period of high winds in the area and elevated PM_{10} concentrations at Niland station. Source: SFSU Department of Earth & Climate Sciences and the California Regional weather Server; http://squall.sfsu.edu/crws/archive/wcsathts_arch.html

FIGURE 5-2
HIGH WINDS IN IMPERIAL COUNTY

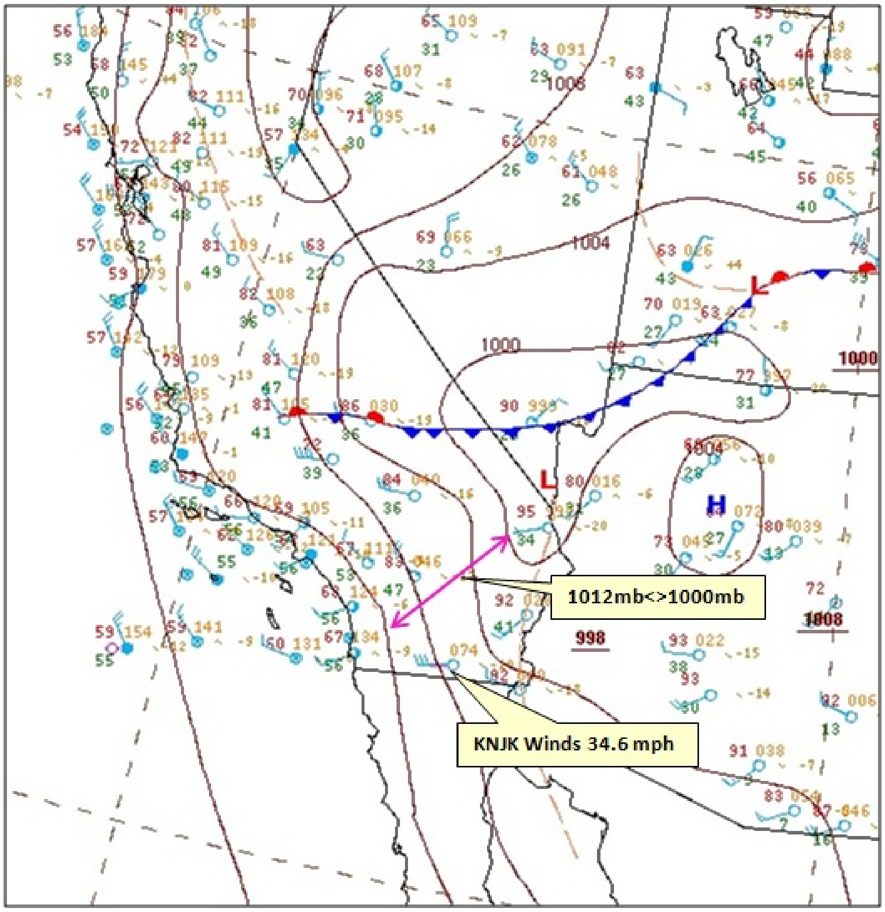


Fig 5-2: Surface Analysis Map depicting surface gradients packed across southeastern California. The 12mb difference between near the coast and the CA-NV border created a strong onshore flow resulting in high winds. High winds from the previous evening, predominantly a northwest direction, that continued into the morning hours of May 15, 2016, combined with the high winds (with higher gusts) in the afternoon, predominant southwest direction, were instrumental in entraining dust into the Imperial County. The wind barb depicts wind of at least 34.6 mph at El Centro NAF (KNJK). Source: WPC Surface Analysis Archive;
http://www.wpc.ncep.noaa.gov/archives/web_pages/sfc/sfc_archive.php

Figure 5-3 depicts the Aerosol Optical Depth using the Deep Blue exponent over the area on May 15 as captured by the MODIS instrument onboard the Terra satellite.[8] Warmer colors indicate

[8] **Aerosol Optical Depth (AOD) (or Aerosol Optical Thickness)** indicates the level at which particles in the air (aerosols) prevent light from traveling through the atmosphere. Aerosols scatter and absorb incoming sunlight, which reduces visibility. From an observer on the ground, an AOD of less than 0.1 is "clean" - characteristic of clear blue sky, bright sun and maximum visibility. As AOD increases to 0.5, 1.0, and greater than 3.0, aerosols become so dense that sun is obscured. Sources of aerosols include pollution from factories, smoke from fires, dust from dust storms, sea salt, and volcanic ash and smog. Aerosols compromise human health when inhaled by people, particularly those with asthma or other respiratory illnesses. Source: https://worldview.earthdata.nasa.gov and **The Deep Blue Aerosol Optical Depth layer** is useful for studying aerosol optical depth

thicker AOD. This image was captured at ~1030 PST shortly after concentrations spiked during the morning before falling by 0900 PST. A thick patch of aerosols is seen just east of the Niland monitor, while a second patch of aerosols can be seen just to the west. This patch of aerosols would have made its way downstream and impacted the monitor later in the day. By mid-afternoon, the Niland monitor was reporting a substantial increase in concentrations.

FIGURE 5-3
HEAVY AEROSOLS OVER IMPERIAL COUNTY – TERRA MODIS

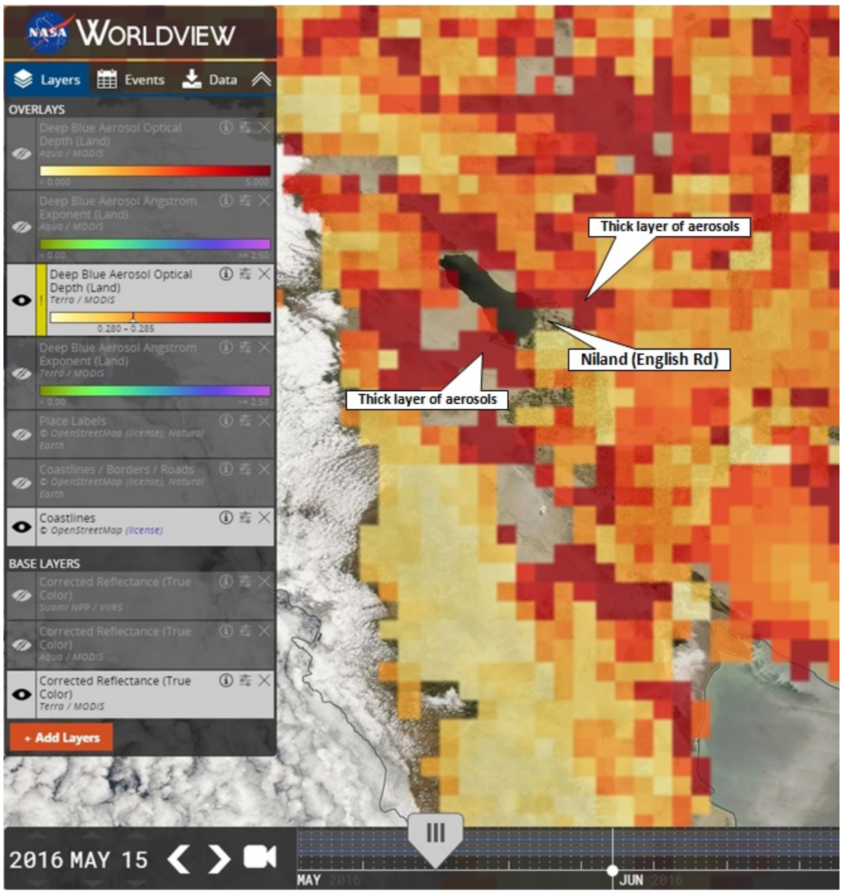


Fig 5-3: The MODIS instrument onboard the Terra satellite captured moderate to heavy patches of aerosols over the Salton Sea near the Niland monitoring station on May 15, 2016. Warmer colors indicate a heavier layer of aerosols. Source: https://worldview.earthdata.nasa.gov/

Figure 5-4 shows the AOD coverage as captured by the MODIS instrument onboard the aqua satellite. This image shows a slightly less dense patch of aerosols over Imperial County. This is expected as the image was captured at 1330 PST which was following a dip in concentrations at

over land surfaces. This layer is created from the Deep Blue (DB) algorithm, originally developed for retrieving over desert/arid land (bright in the visible wavelengths) where Dark Target approaches fail. The MODIS Deep Blue Aerosol Optical Depth (Land) layer is available from both the Terra (MOD04_L2) and Aqua (MYD04_L2) satellites for daytime overpasses. The sensor/algorithm resolution is 10 km at nadir, imagery resolution is 2 km at nadir, and the temporal resolution is daily. Resolution is much coarser out toward the edge of the swath.

the Niland monitor, and prior to the elevated concentrations that came later in the afternoon.

FIGURE 5-4
HEAVY AEROSOLS OVER IMPERIAL COUNTY – AQUA MODIS

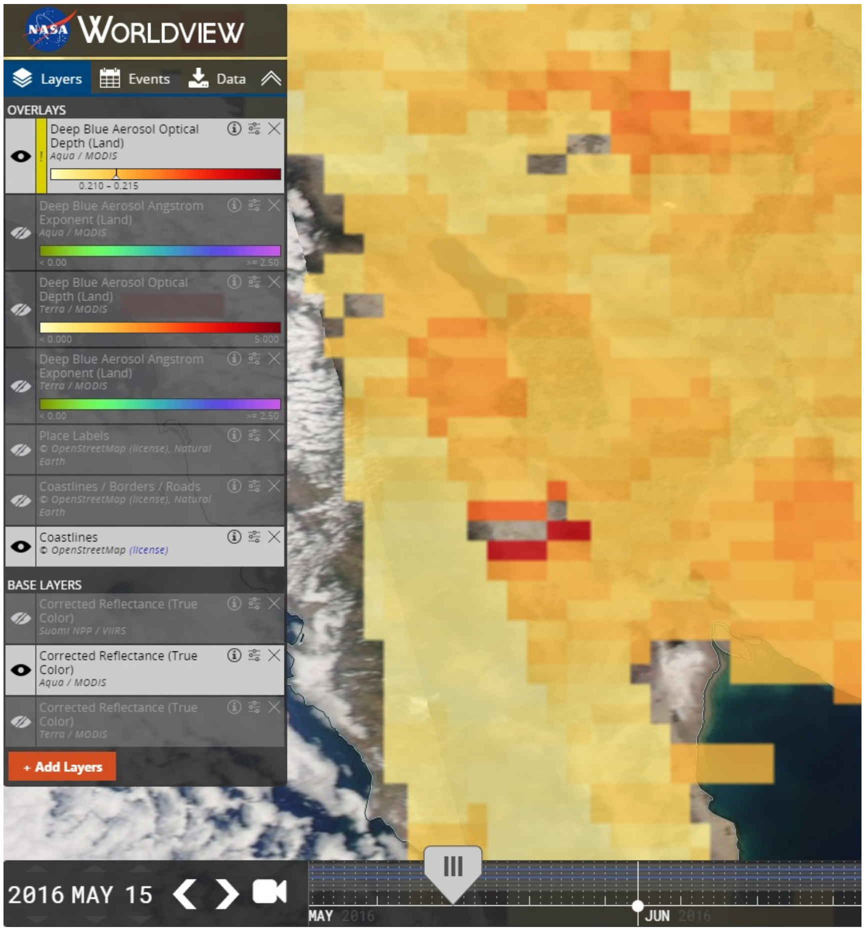


Fig 5-4: The MODIS instrument onboard the Aqua satellite captured a moderate layer of aerosols over Imperial County on May 15, 2016. Warmer colors indicate a heavier layer of aerosols. Source: https://worldview.earthdata.nasa.gov/

The EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states.[9] **Tables 5-1, 2-3 and 2-4** provide a temporal relationship of wind speeds, wind direction, wind gusts (if available), and PM_{10} concentrations at the monitors located within the northern section of Imperial County. The Niland monitor (the only station to exceed the NAAQS) measured elevated hourly concentrations during the morning and late afternoon hours on May 15, 2016. The elevated concentrations measured during the morning hours, **Tables 2-3 and 2-4**, were primarily as a result of strong gusty northwest winds that commenced the evening prior (May 14, 2016). By mid afternoon on May 15, 2016 elevated wind speeds shifted to a southwest direction causing peak hourly concentrations during the afternoon hours. Overall, peak hourly

[9] "Treatment of Data Influenced by Exceptional Events; Final Guidance", FR Vol. 81, No. 191, 68279, October 3, 2016

concentrations measured during the morning and afternoon followed periods of high upstream wind speeds.

TABLE 5-1
UPSTREAM WIND SPEEDS AND NILAND PM_{10} CONCENTRATIONS MAY 15, 2016

EL CENTRO NAF (KNJK)				OCOTILLO WELLS (AS938)				NAVAL TEST BASE				NILAND			NILAND		WESTMORLAND	BRAWLEY
HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/D	HOUR	PM_{10} (µg/m³)	PM_{10} (µg/m³)	PM_{10} (µg/m³)
56	16		260	2	18	29	306	0	15	15	262	0	13	255	0	234	37	18
156	15		250	105	17	29	315	100	17	17	248	100	5	260	100	114	30	9
256	11		250	206	19	37	336	200	21	21	242	200	1	243	200	106	10	6
356	21		250	304	24	38	333	300	19	19	249	300	5	115	300	99	13	7
456	20		250	400	24	43	334	400	21	21	242	400	4	272	400	121	55	9
556	9		210	503	19	32	327	500	18	18	255	500	11	272	500	183	57	16
656	8		250	601	22	38	274	600	18	18	258	600	8	266	600	173	29	21
756	16		270	701	15	24	330	700	17	17	256	700	7	255	700	208	28	20
856	3		300	805	17	34	329	800	11	11	275	800	9	251	800	303	23	24
956				901	15	25	306	900	9	9	258	900	10	261	900	53	171	22
1056	17		250	1004	17	30	307	1000	2	2	352	1000	8	288	1000	58	84	20
1156	24	30	240	1101	21	36	315	1100	3	3	299	1100	6	243	1100	59	62	35
1256	25	32	250	1201	18	36	319	1200	22	22	251	1200	8	240	1200	69	49	35
1354	26	32	250	1301	17	33	310	1300	26	26	246	1300	11	259	1300	133	110	63
1458	30	36	260	1402	20	34	293	1400	29	29	242	1400	17	261	1400	270	147	128
1558	32		260	1501	21	38	320	1500	29	29	239	1500	20	258	1500	334	227	163
1641	30	36	250	1601	19	37	285	1600	30	30	240	1600	23	253	1600	627	242	219
1737	23	31	250	1701	20	46	317	1700	29	29	240	1700	23	250	1700	671	411	186
1822	32	38	260	1801	23	39	307	1800	25	25	240	1800	22	250	1800	494	112	214
1956	29	36	270	1901	21	37	326	1900	23	23	237	1900	22	252	1900	214	111	98
2056	26	32	260	2001	20	41	334	2000	20	20	245	2000	21	252	2000	139	69	68
2156	20		260	2102	20	35	312	2100	18	18	252	2100	18	258	2100	144	206	13
2256	23		260	2201	21	38	337	2200	19	19	253	2200	16	260	2200	169	85	22
2356	24		250	2301	21	39	304	2300	21	21	253	2300	14	263	2300	209	33	11

*Wind data for KNJK from the NCEI's QCLCD system. Wind data for Ocotillo wells (AS938) from the University of Utah's MesoWest system. Naval Test Base wind from AQMIS2. Niland station wind data is from the EPA's AQS data bank. Neither Niland nor the Naval Test Base records wind gusts. Wind speeds = mph; Direction = degrees

Figure 5-5 depicts a 6-hour HYSPLIT back-trajectory ending at Niland at 1700 PST during the afternoon hour when the Niland monitor measured peak hourly afternoon concentrations. As discussed above, the early morning measured elevated concentrations resulted from northwesterly winds commencing from the evening of May 14, 2016 into May 15, 2016. **Figure 2-21** illustrates the morning airflow ending at 0800 PST on May 15, 2016. Niland was the only monitor to exceed the standard on May 15, 2016.

The gusty westerly winds that blew into Imperial County on May 15, 2016 resulted from a Pacific weather system that was moving in from the north in an easterly direction. Although the zonal flow was a west to east direction, and the onshore flow strengthened resulting in increased winds. The Pacific weather system remained primarily to the north shifting only late May 15, 2016 further east towards the southwestern portion of Arizona. This created favorable conditions for a significant impact upon the northern air monitors in Imperial County, specifically Niland. The slightly lower wind speeds directly west of Westmorland and Brawley (**Figure 5-7**), the northwest direction of the winds during the early morning hours of May 15, 2016 and the location of the monitors allowed for less deposition of PM_{10} upon the Westmorland and Brawley monitors. Similarly, the El Centro and Calexico monitors, further south and much further away from the northern flow, likewise measured lower concentrations during the early morning hours. However, as winds shifted in direction during the afternoon hours all the monitors in Imperial County measured elevated concentrations, with Niland and Westmorland measuring six consecutive hours of elevated concentrations. The lack of any significant morning elevated concentrations measured at the Westmorland, Brawly, El Centro or the Calexico monitors kept the 24-hour average concentration below the NAAQS.

The exceedance at the Niland monitor resulted when elevated winds blew from the northwest during the evening hours of May 14, 2016 into the morning hours of May 15, 2016 affecting morning concentrations. A crucial factor to the exceedance at the Niland monitor is the strength of the evening winds. Although the airflow during the morning hours is over the Salton Sea, sufficient entrained PM_{10} by the upper airflow, combined with the BACM area soils between the edge of the Salton Sea and the monitor affected the Niland monitor. As winds diminished from the northwest, a shift in winds from the southwest commenced adding to the already entrained PM_{10} suspended in the air. This cause the Niland monitor to continue to measure elevated concentrations well above other stations causing an exceedance of the NAQQS in Imperial County.

FIGURE 5-5
TIMELINE OF ENTRAINMENT

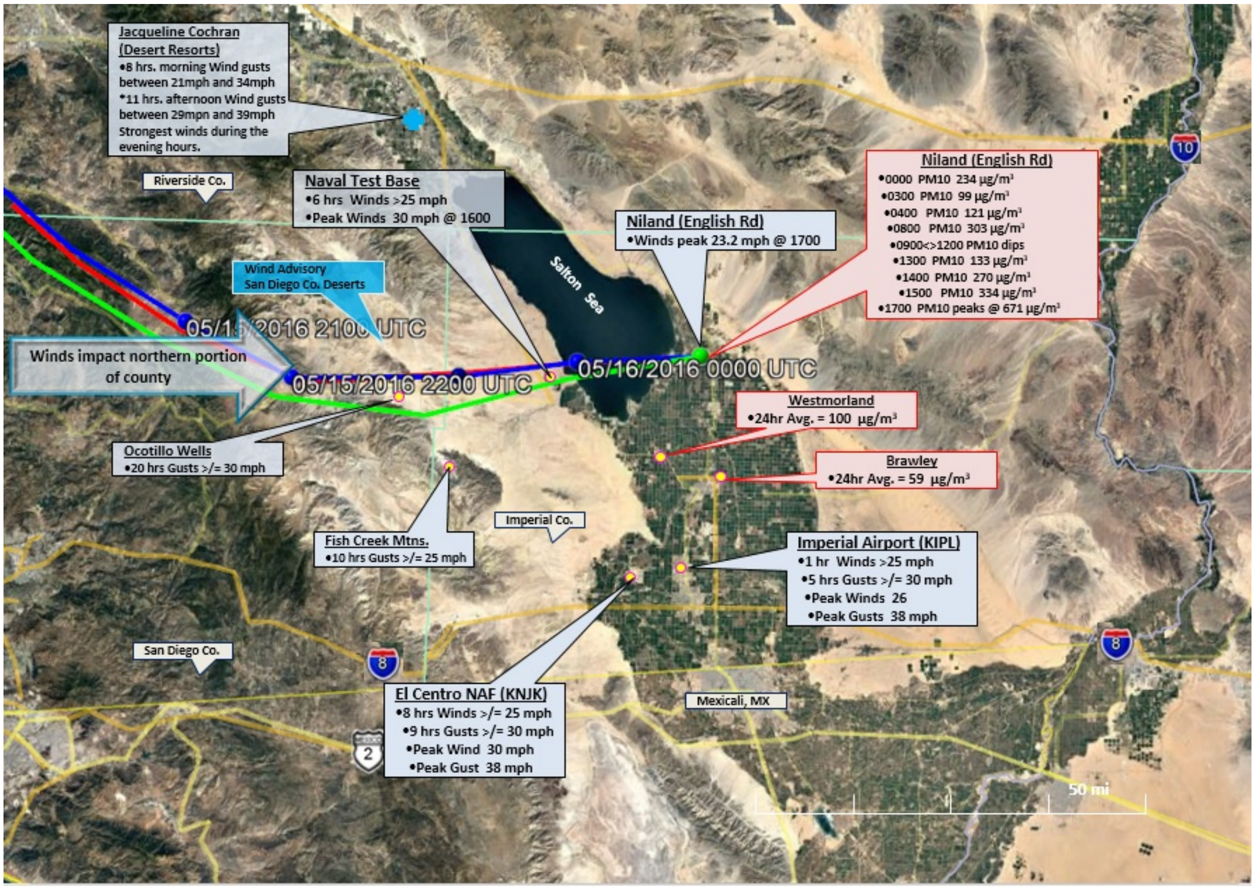


Fig 5-5: High winds in the northern portion of the county swept across natural desert areas west of the Niland monitoring station entraining windblown dust. The 6-hour HYSPLIT back-trajectory shows the path of air flowing during the afternoon of May 15, 2016 ending at the Niland monitoring station at 1700 PST coincident with the afternoon hourly peak. Red trajectory is airflow at the 10m level; blue is 100m. Green is 500m. Times given are for the blue trajectory. Aqua lines depict county borders. Generated through NOAA's Air Resources Laboratory. Base map from Google Earth

Figures 5-6 and 5-7 depicts PM_{10} concentrations, wind speeds, and wind direction at the Niland monitoring station for three days, May 14, 2016 through May 16, 2016. Elevated concentrations at the Niland monitor are coincident with elevated wind speeds and gusts. While the direction of the airflow is a significant factor in explaining why other air monitors in Imperial did not violate, the correlation between the increases in wind speeds, wind gusts and concentrations is evident.

Appendix C contains additional graphs illustrating the relationship between PM_{10} concentrations and wind speeds from regional monitoring sites within Imperial County, Riverside County, and Yuma, Arizona during the wind event.

FIGURE 5-6
NILAND PM_{10} CONCENTRATIONS & WIND SPEED CORRELATION

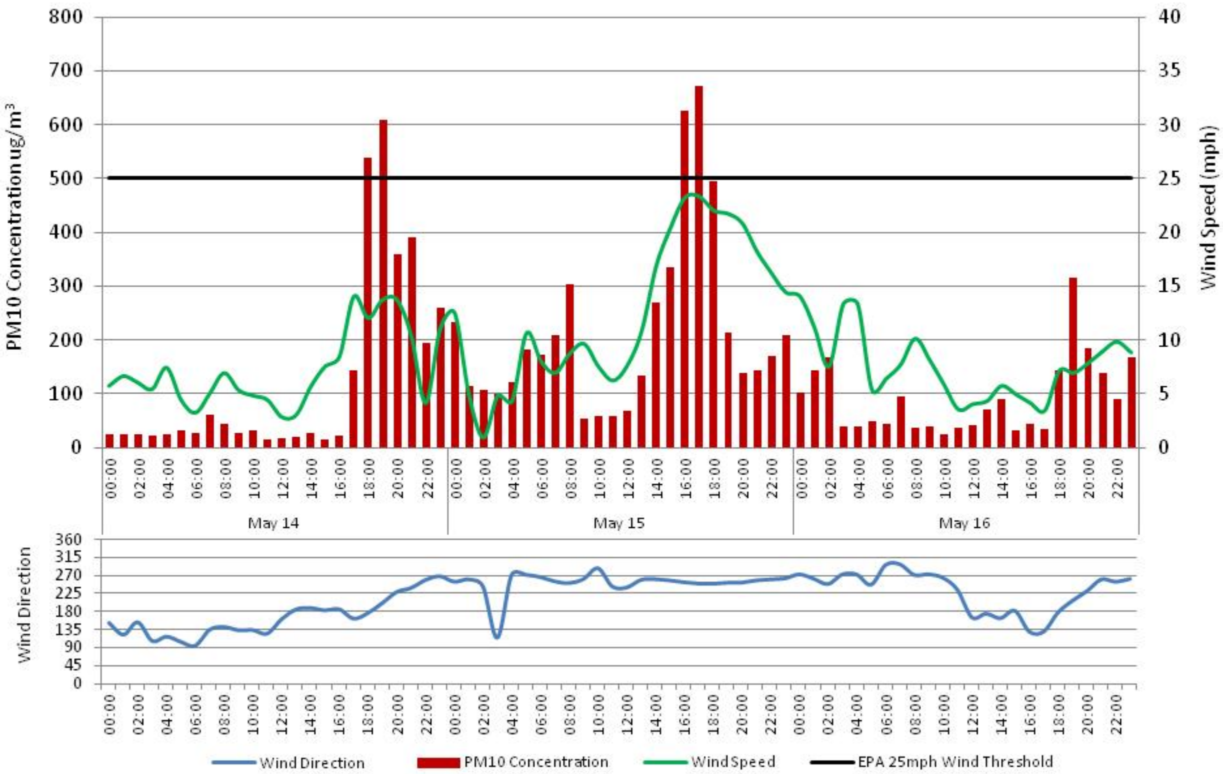


Fig 5-6: Fluctuations in hourly concentrations over 72 hours (three days) show a positive correlation with wind speeds at the Niland monitoring station. Niland does not measure gusts. Black line indicates 25 mph threshold. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system.

FIGURE 5-7
NILAND PM_{10} CONCENTRATIONS & UPSTREAM WINDS

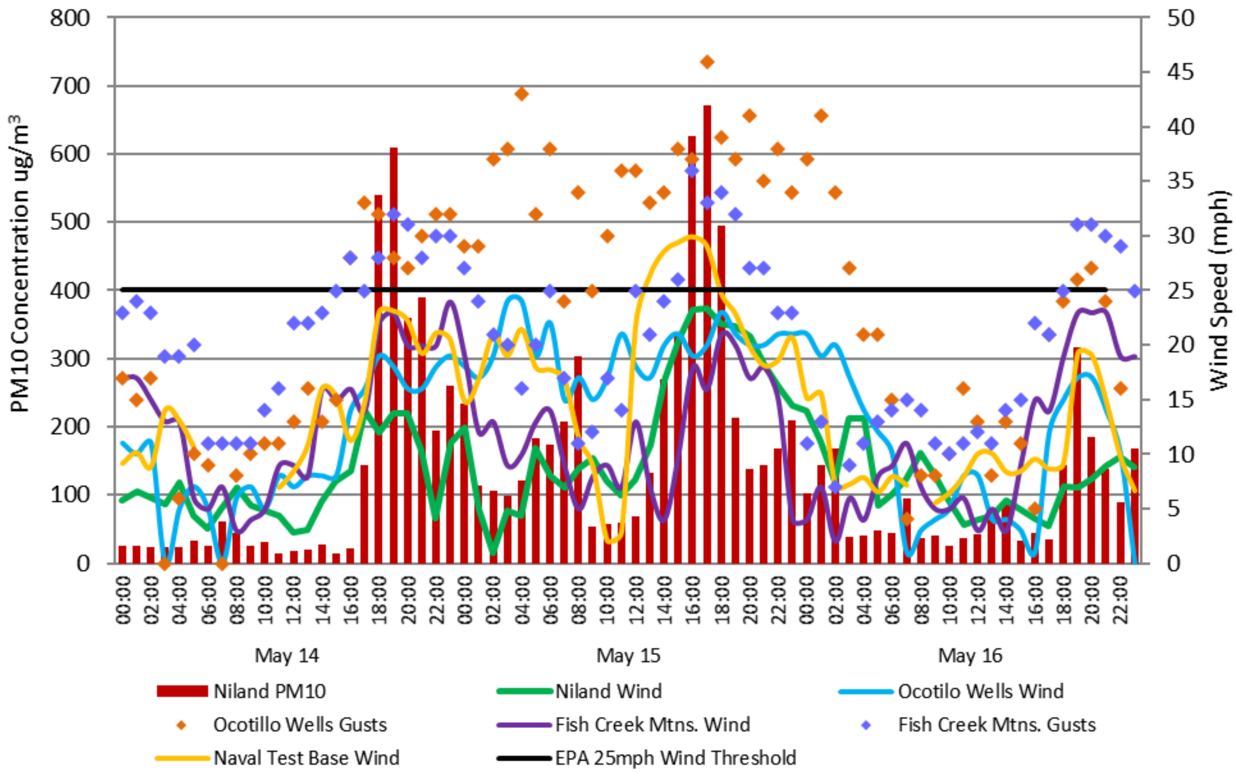


Fig 5-7: Increasing winds and gusts early in the morning, then again in the afternoon, led to a subsequent rise in concentrations Niland. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank.

Figure 5-8 compares the concentrations at Calexico, El Centro, Brawley, Westmorland, and Niland over a 72-hour period (three days) May 14, 2016 through May 16, 2016. Visibility at the Imperial County Airport (KIPL) and the El Centro NAF (KNJK) dipped severely around 1800 PST.[10] As mentioned above, lower visibility at local airports is consistent with the affect from the Pacific weather system that was primarily a northern event until the system caused a shift in wind direction from the southwest. Visibility during the morning hours was not as significantly affected simply because the predominant wind direction during the morning hours of May 15, 2016 was from the northwest while the afternoon hours saw a southwest direction.

[10] According to the NWS there is a difference between human visibility and the visibility measured by an Automated Surface Observing System (ASOS) or an Automated Weather Observing System (AWOS). The automated sensors measure clarity of the air vs. how far one can "see". The more moisture, dust, snow, rain, or particles in the light beam the more light scattered. The sensor measures the return every 30 seconds. The visibility value transmitted is the average 1-minute value from the past 10 minutes. The sensor samples only a small segment of the atmosphere, 0.75 feet therefore an algorithm is used to provide a representative visibility. Siting of the visibility sensor is critical and large areas should provide multiple sensors to provide a representative observation; http://www.nws.noaa.gov/asos/vsby.htm

FIGURE 5-8
72-HOUR TIME SERIES PM_{10} CONCENTRATIONS AND VISIBILITY

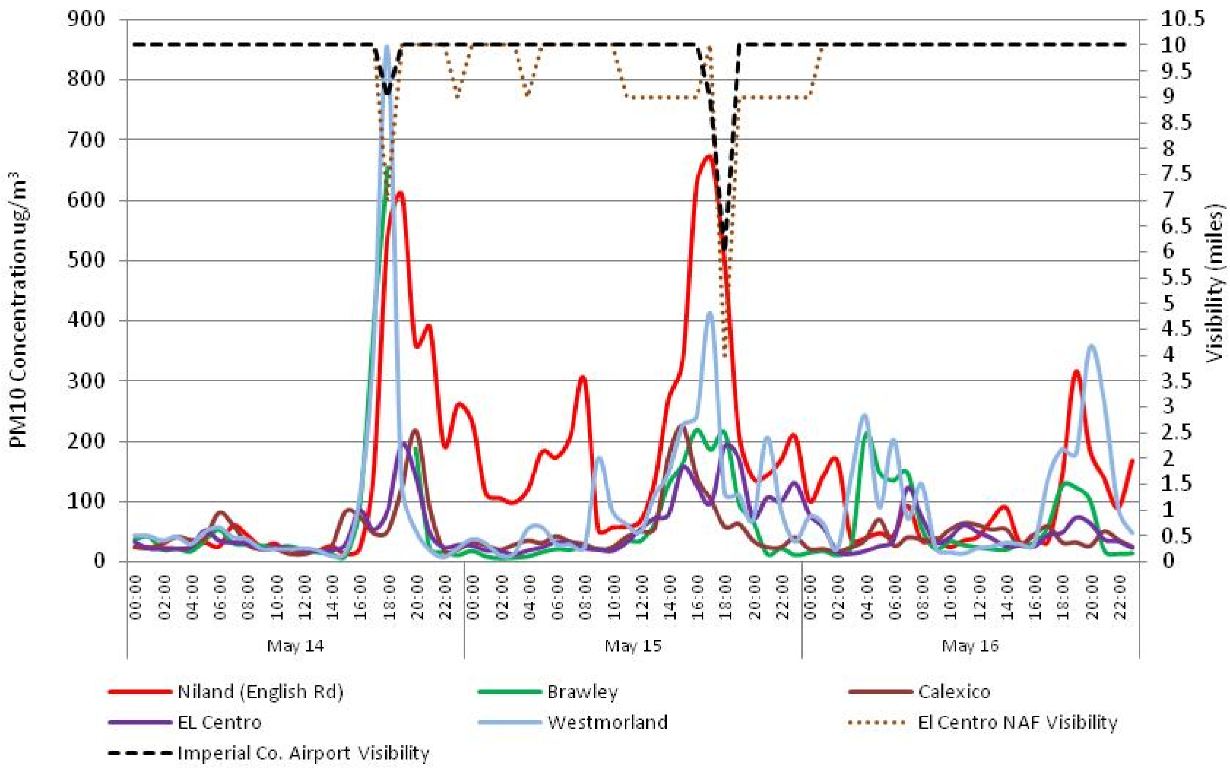


Fig 5-8: Visibility as reported from the Imperial County Airport (KIPL) shows that visibility dipped significantly at KIPL prior to peak concentrations at Brawley and Westmorland. KIPL is the closer of the two airfields to Brawley and Westmorland. Visibility data from the NCEI's QCLCD data bank

The May 15, 2016 wind event was a "northerly" event that primarily affected Niland. Winds and gusts were strongest from the northwest during the evening hours of May 14, 2016 and the morning hours of May 15, 2016. Although, the winds were elevated along the corridor from Ocotillo Wells-Naval Test Base than the southern portion of Imperial County it was not sufficient to cause a significant impact upon the Westmorland and Brawley monitors during the morning hours of May 15, 2016. By the afternoon hours of May 15, 2016, winds shifted to a southwest direction allowing for elevated concentrations at all monitors during the late to evening hours of May 15, 2016. However, these afternoon winds, by themselves was insufficient to cause an exceedance at the monitor. Only the Niland monitor, affected by the northwest winds during the evening of May 14, 2016 and early morning hours of May 15, 2016, and the southwest winds during the afternoon to evening hours of May 15, 2016 exceeded the NAAQS.

FIGURE 5-9
AIR QUALITY IN NILAND MAY 15, 2016

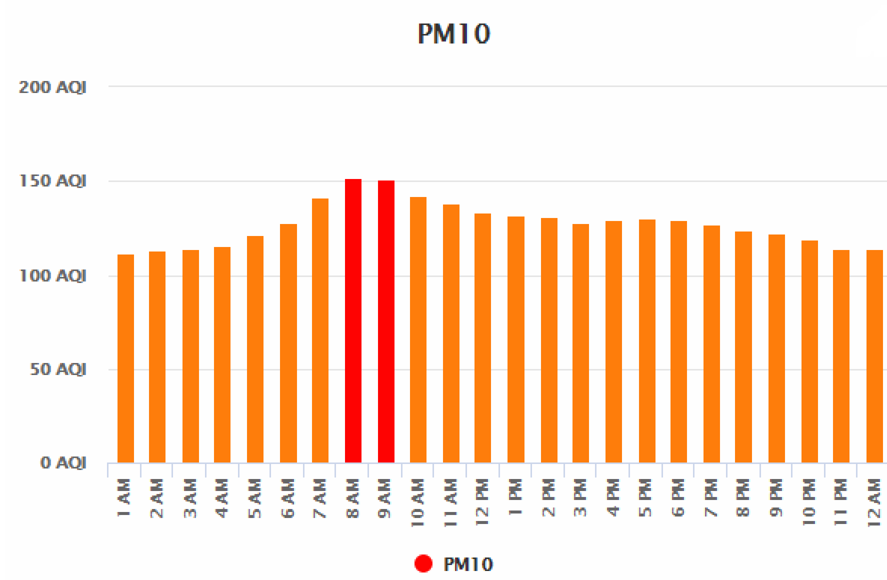


Fig 5-9: Air quality in the Niland area was impacted by dust transported into the area by gusty winds on May 15, 2016.

V.2 Summary

The preceding discussion, graphs, figures, and tables provide wind direction, speed and concentration data illustrating the spatial and temporal effects of the gusty west winds caused by the tightening of the pressure gradients associated with a Pacific weather system that moved through the Pacific Northwest in an east-southeast direction towards Arizona. The information provides a clear causal relationship between the entrained windblown dust and the PM_{10} exceedance measured at the Niland monitor on May 15, 2016. Furthermore, the advisories and air quality index illustrate the affect upon air quality within the region extending from the mountains and desert slopes of San Diego County, all of Imperial County and the southern portion of Riverside County. Strong westerly winds entrained PM_{10} into the lower atmosphere causing a change in the air quality conditions within Imperial County. The entrained dust originated from as far as the mountains and desert slope areas located within San Diego County, Riverside County and Imperial County (part of the Sonoran Desert). Combined, the information demonstrates that the elevated PM_{10} concentrations measured on May 15, 2016 coincided with high wind speeds and that gusty west winds occurred over the Riverside County, San Diego County, all of Imperial County, and Arizona.

FIGURE 5-9
MAY 15, 2016 WIND EVENT TAKE AWAY POINTS

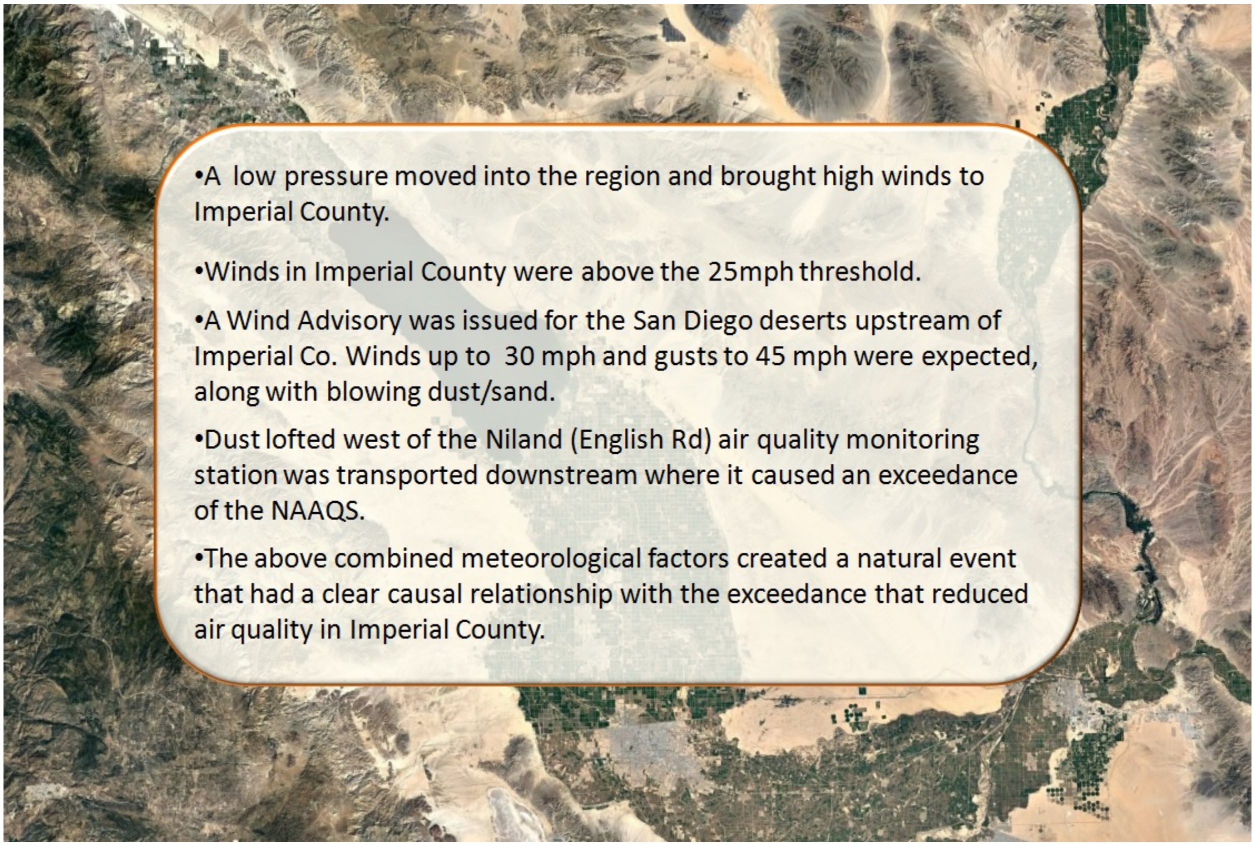


Fig 5-9: Illustrates the factors that qualify the May 15, 2016 natural event, which affected air quality as an Exceptional Event.

VI Conclusions

The PM_{10} exceedance that occurred on May 15, 2016, satisfies the criteria of the EER which states that in order to justify the exclusion of air quality monitoring data evidence must be provided for the following elements:

TABLE 6-1 TECHNICAL ELEMENTS CHECKLIST EXCEPTIONAL EVENT DEMONSTRATION FOR HIGH WIND DUST EVENT (PM_{10})		DOCUMENT SECTION
1	A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	6-32; 59
2	A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation	43-57; 58
3	Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3)(iv)(B) of this section	33-36; 59
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	37-44; 58
5	A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event	43-57; 58

VI.1 Affects Air Quality

The preamble to the revised EER states that an event is considered to have affected air quality if it can be demonstrated that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation. Given the information presented in this demonstration, particularly Section V, we can reasonably conclude that there exists a clear causal relationship between the monitored exceedance and the May 15, 2016 event which changed or affected air quality in Imperial County.

VI.2 Not Reasonably Controllable or Preventable

In order for an event to be defined as an exceptional event under section 50.1(j) of 40 CFR Part 50 an event must be "not reasonably controllable or preventable." The revised preamble explains that the nRCP has two prongs, not reasonably preventable and not reasonably controllable. The nRCP is met for natural events where high wind events entrain dust from desert areas, whose sources are controlled by BACM, where human activity played litter or no direct causal role. This demonstration provides evidence that despite BACM in place within Imperial County, high winds overwhelmed all BACM controls where human activity played little to no direct causal role. The PM_{10} exceedance measured at the Niland monitor was caused by naturally occurring strong gusty west winds that transported fugitive dust into Imperial County and other parts of southern California from areas located within the Sonoran Desert regions to the west of Imperial County. These facts provide strong evidence that the PM_{10} exceedances at Niland on May 15, 2016, were not reasonably controllable or preventable.

VI.3 Natural Event

The revised preamble to the EER clarifies that a "Natural Event" (50.1(k) of 40 CFR Part 50) is an event and its resulting emissions, which may recur at the same location where anthropogenic sources that are reasonably controlled are considered not to play a direct role in causing emissions, thus meeting the criteria that human activity played little or no direct causal role. As discussed within this demonstration, the PM_{10} exceedance that occurred at Niland on May 15, 2016, was caused by the transport of fugitive dust into Imperial County by strong westerly winds associated with the passage of low pressure system that moved through the region. At the time of the event anthropogenic sources were reasonably controlled with BACM. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM_{10} concentrations at Niland during different days, and the comparative analysis of different areas in Imperial and Riverside county monitors demonstrates a consistency of elevated gusty west winds and concentrations of PM_{10} at the Niland monitoring station on May 15, 2016 (Section V). In addition, these time series plots and graphs demonstrate that the high PM_{10} concentrations and the gusty west winds were an event that was widespread, regional and not preventable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty west winds. Days immediately before and after the high wind event PM_{10} concentrations were well below the NAAQS. Overall, the demonstration provides evidence of the strong correlation between the natural event and the entrained fugitive emissions to the exceedance on May 15, 2016.

VI.5 Historical Concentrations

The historical annual and seasonal 24-hr average PM_{10} values measured at the Niland monitor was historically unusual compared to a multi-year data set (Section III).

Appendix A: Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

This section contains wind advisories issued by the National Weather Service and Imperial County on or around May 15, 2016. In addition, this Appendix contains the air quality alert issued by Imperial County advising sensitive receptors of potentially unhealthy conditions in Imperial

County resulting from the strong gusty winds. The data show a region-wide increase in wind speeds and wind gusts coincident with the arrival of dust and high PM_{10} concentrations in Imperial County.

Appendix B: Meteorological Data.

This Appendix contains the time series plots, graphs, wind roses, etc. for selected monitors in Imperial and Riverside Counties. These plots, graphs and tables demonstrate the regional impact of the wind event.

Appendix C: Correlated PM_{10} Concentrations and Winds.

This Appendix contains the graphs depicting the correlations between PM_{10} Concentrations and elevated wind speeds for selected monitors in Imperial and Riverside Counties. These graphs demonstrate the region wide impact of the wind event.

Appendix D: Regulation VIII – Fugitive Dust Rule.

This Appendix contains the compilation of the BACM adopted by the Imperial County Air Pollution Control District and approved by the United States Environmental Protection Agency. A total of seven rules numbered 800 through 806 comprise the set of Regulation VIII Fugitive Dust Rules.